ESCOP 2015

17–20 September
Paphos, Cyprus

19TH CONFERENCE OF THE EUROPEAN SOCIETY FOR COGNITIVE PSYCHOLOGY

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CONFERENCE ABSTRACTS

Programme

Thursday, 17 September 2015

Poster Presentations

17:30 – 19:30 | Poster Session A

Friday, 18 September 2015

Symposiums

09:00 – 11:00 | Attention and working memory: commonalities and differences (Invited Symposium sponsored by ESCOP and the Psychonomic Society)

Automatic and strategic processes in the Stroop effect

Current methods and advances in prospective memory research

Big data approaches to understanding visual word recognition

What Bayesian methods can do for cognitive science

Implicit vs. explicit learning and consolidation

Neurocognitive correlates of cognitive control

Social and emotional information processing in the developing brain

Oral Presentations

11:30 – 13:10 | Working memory I

Task switching

Language I

Memory I

Bilingualism

Numerical cognition I

Speech processing

Decision mechanisms

14:20 – 16:00 | Attention and cognitive control

Visual perception

Language II

Memory II

Bilingualism II

Social cognition

Reading and text comprehension

Spatial cognition

Poster Presentations

17:30 – 19:30 | Poster Session B

Saturday, 19 September 2015

Symposiums

09:00 – 11:00 | A fight against forgetting from working memory: refreshing and removal

How is serial order coded in working memory?

Bridging cognitive psychology and artificial intelligence (Symposium sponsored by IBM and the Journal of Artificial Intelligence)

How cognition supports social interaction: From joint action to dialogue

Relationship between attentional set and task-set

Unconscious influences on goal-directed cognition (Symposium sponsored by the British Psychological Society, Cognitive Psychology Section)

Cognitive plasticity: evidence for behavioral and neural changes after intensive cognitive training

Circadian influences on human cognition: a multidisciplinary approach from cognitive neuroscience and chronobiology

Oral Presentations

11:30 – 13:10 | Attention I

Numerical cognition II

Language III

Cognitive control I

Visual word recognition

Dyslexia / phonological processing

Cognitive aging / dementia

Learning

14:20 – 16:00 | Attention II

Working memory II

Action / perception

Cognitive control II

Emotion I

Bilingualism III

Neuropsychology

Reasoning

Poster Presentations

17:30 – 19:30 | Poster Session C

Sunday, 20 September 2015

Symposiums

09:00 – 10:40 | The role of long-term memory in working memory

Executive control in affective contexts: evidence from healthy, clinical and paediatric populations

Current trends in associative learning

The cognitive effects of bilingualism

Social antecedents and consequences of action control

How emotion and motivation influence cognitive control

Modulating the social brain via transcranial Direct Current Stimulation (tDCS)

The role of stress in visual word recognition and reading aloud

Oral Presentations

11:00 – 12:00 | Attention and objects

Face processing

Emotion II

Memory and categorisation

Poster Presentation

Session A

Coupling and decoupling attentional set and task-set

C.S. Longman[1], A. Lavric[1], S. Monsel[1]

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One potential contributor to the performance overhead that results from switching tasks ('switch cost') is the need to re-orient attention to the task-relevant stimulus attribute. In eye-tracking experiments using tasks consistently associated with different spatial locations we (Longman et al., 2014) found that switching tasks delayed orientation to the relevant location, and resulted in a tendency to fixate the previously relevant location, which we refer to as "attentional inertia", even with plenty of time for preparation. Studies looking at task switches involving other other kinds of attention shift have sometimes obtained similar evidence for inertia, sometimes not. Could these inconsistencies be related to the degree of coupling (integration) of attentional set and task-set? Our 2014 study used verbal task cues which explicitly identified the required digit-categorisation task (e.g. 'ODD?', 'HIGH?') and thus encouraged participants to access attentional settings via the task-set. In new experiments we have found that replacing the task-cues with explicit location cues (arrows or directional words) which encourage participants to reorient attention independently of the task-set largely eliminated the attentional handicaps associated with switching between tasks, but substantially increased the switch cost, suggesting decoupling of attentional set from other components of task-set. Thus, attentional handicaps may contribute to switch costs only when attentional settings are integrated into (and accessed via) the task-set. In a further experiment we used arbitrary cues (e.g. 'A', 'X') to ascertain which of these two strategies is the more 'natural' – to couple or decouple attentional set and task-set. The results suggest that the natural tendency is for attentional set and task-set to be strongly coupled and that only radical manipulations such as cues which emphasise allocation of spatial attention over other aspects of the task can result in their decoupling.

Poster Presentation

When meaning matters: The temporal dynamics of semantic influences on visual attention

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An important question is to what extent visual attention is driven by the semantics of individual objects, rather than by their visual appearance. We focussed on the hypothesis that timing is crucial in the occurrence and strength of semantic influences on visual orienting. To explore this hypothesis, we continuously measured eye movements throughout search, while we manipulated the timing of the target instruction which was presented either before or after visual stimulus onset. On crucial trials, the target was absent but the display contained objects that were either semantically or visually related to the target. We show a substantial, but delayed bias in orienting towards semantically compared to visually related objects when target instruction was presented before visual stimulus onset. This delay was completely undone by presenting the visual information before the target instruction. Furthermore, the absence or presence of visual competition did not change the temporal dynamics of the semantic bias. Visual orienting is thus driven by priority settings that dynamically shift between visual and semantic representations, with each of these types of bias operating largely independently. Followup studies then explored the influence of semantic versus visual biases in memory-based search, when the target instruction is presented after the pictures have been removed. We found that people fixate on locations previously occupied by target objects (a replication of earlier findings), but also on locations previously occupied by semantically and visually related objects. Here too the dynamics differed for visual and semantic biases: Where semantic biases towards memorized objects were sustained across times, visual biases appeared more transient. Overall, our findings fit with a cascaded activation model, and show that the question as to whether, or to what extent, visual orienting is driven by semantic content is better rephrased as to when visual orienting is driven by semantic content.

Poster Presentation

Esthetic judgments on ugliness and beauty of human bodies and faces elicit differential electrophysiological signatures

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The brain correlates of the esthetic preference have been widely approached using a heterogeneous range of objects. Among them, human faces are represented but no that much the rest of the body. This study aims at investigating how the esthetic evaluation of faces and bodies of both genders differentially implies and interlinks visuo-perceptual, multimodal integration and decision-making processes. We expected that this task would induce differential allocation of attentional resources depending on motivational and affective features of the material to be evaluated. Prior to the EEG session, the participants rated the stimuli in a scale ranging from 'Very ugly' (scored 1) to 'Very beautiful' (scored 10). This allowed the selection of three sets of the most beautiful (range 8-10), the most ugly (range 1-3) and the neutral (range 4-6) faces and bodies for each participant. In the EEG session, they performed a task consisting in a beautiful-neutral-ugly judgment. Main findings revealed a P200 amplitude increase specifically to ugly images, probably reflecting a negativity bias in low-level attentional processes. In turn, such a bias could lead to deem our material as negatively valenced. A P300 increase was also found mostly to beautiful images, particularly to female nude bodies, which is consistent with the salience and rewarding features of these stimuli, particularly for stimulus evaluation and categorization. Finally, higher-order evaluating processes were reflected in an LPC that appeared significantly larger to the most salient, ugly and beautiful images. This result probably reflects later, decision processes on highly-relevant information kept into working memory. This finding was especially remarkable for ugly male faces. This study revealed that judgment on esthetics of the human face and body mobilizes different attentional resources throughout the processing of appetitive (beautiful) and (aversive) ugly images.

Poster Presentation   **Session A**

Can attention control training improve tennis performance: Transfer effects on gaze behaviour, inhibitory control and working memory capacity

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Recent theoretical advances have positioned that attentional control processes of working memory play a predictive role in explaining sports performance outcome(s). Here we examined how attentional control training improved motor skill performance by reducing distractibility and increasing working memory capacity and attentional control in tennis players undertaking a live tennis task. In two studies participants randomly allocated to a training group versus a control group undertook 6 daily sessions on a visual search training task designed to promote distractor inhibition. Transfer of training on performance was examined using returns of serves, a flanker task and an antisaccade task designed to provide a process pure measure of inhibition. We found that attentional control training improved inhibitory control as assessed by the antisaccade task. Training related gains transferred to the field task involving the return of serves that included an objective assessment of independent raters. A further study showed that attentional control training using the visual search task increased working memory capacity using a visual change detection task. Furthermore, we found transfer effects of attentional control training to specific measures of gaze behaviour instrumental in predicting sports performance. Our findings are the first to demonstrate that attentional control training can improve motor skill performance in interactive sports such as tennis by increasing the efficiency of the inhibition component of working memory and are indicative of the instrumental role of inhibitory control in successful sports performance.

Poster Presentation

Session A

The activation of context-specific attentional control sets

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The extent of attentional control can be regulated according to certain contextual demands. For example, contexts associated with high conflict frequency (e.g., 80% conflict trials presented at location above) involve stronger attentional control than contexts with low conflict frequency (e.g., 20% conflict trials presented at location below). The corresponding control set can be activated in a bottom-up manner when stimuli are presented at the specific context. Here we ask whether low level visual attention features are sufficient in activating the context-specific attentional control set. For example, the mere onset of a stimulus might disambiguate the relevant location context and thus, might serve as low level mechanism that activates the context-specific control setting. Therefore, task-relevant target stimuli and task-irrelevant dummy stimuli were presented each at one location, so that the onsets of stimuli at both contexts should compete for triggering the appropriate control setting. Results of three experiments with varied onset-intensity showed, that the mere onset of either stimulus is not sufficient to prime the context-associated attentional control set. Instead, the attentional control set becomes activated only after stimulus identification.

Poster Presentation

The impact of authority on attention and object perception: An Event-Related brain potentials study

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Social psychology has extensively studied the effects of authority on behaviors such as decision making. However, it is not known whether authority has an impact on earliest cognitive processes. In this study, we tested the hypothesis that authority can modulate attention and object perception mechanisms, using a masked priming paradigm with ERPs. Each experimental trial consisted on the presentation of one of the four following masked figures; a bishop, a priest, a general, or a soldier. This way, we could present subliminally either one of two types of authority (religious, military), or two grades of authority (high, low), orthogonally. Subsequent to each subliminal presentation, participants performed a categorization task, classifying an artwork as Christian or as non-Christian according to their own criteria. Artworks were previously validated by a different group of participants and included a set of Christian, non- Christian, and ambiguous objects. Brain activity time-locked to artwork's presentation showed increased amplitude of P1 and N1 ERP attentional components for both ambiguous and non-Christian artworks when primed by a high vs. low grade of authority, regardless of its type. Conversely, an increase of the P2 amplitude was observed only for ambiguous artworks after the masked presentation of a low (vs. high) authority figure, again independently of the type of authority. Finally, later modulations on the P3 component showed effects of the type of authority on ambiguous artworks: we found increased amplitude after a religious or a military masked figure depending on the posterior categorization (as Christian or as non-Christian, respectively) of the object. These results suggest that both selective attention and post-decisional mechanisms seem to be influenced unconsciously by authority figures.

Poster Presentation

Interruption and distraction, a new cognitive model

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Interruptions of ongoing activities can sometimes have severe consequences, causing life-threatening situations. However, this phenomenon is not entirely explained by a single cognitive model. We propose a new five-stage model, the DETOUR (Decision, Encoding, Task switching, Operating & Updating, Resumption), that takes into account the main current attention and working memory theories. It is based on the assumption that executing an action requires the activation of the appropriate action schemas and goals. The DETOUR explains the cognitive stages when a primary task detects an unrelated alert. The First stage (Decision) comprises the initial disengagement from the primary task to analyze the alert and the decision of what to do next: either resuming the primary task (the alert generating a distraction) or performing the rival task (the alert generating an interruption). In the case of an interruption, the Encoding stage follows, allowing the user to encode the Primary Task Schemas and Goals (PTSG) for later resumption. Next, the Task switching step consists in the simultaneous inhibition of the PTSG and activation of the interruption task schemas. The higher the overlap between these schemas, the larger the potential negative impacts such as action errors and decrease in speed. Next, the Operating & Updating stage contains both the execution of the interruption task per se as well as the maintenance of PTSG. It is assumed that when the updating processes cannot proceed the level of activation of the PTSG will decrease rapidly until complete extinction after 30 seconds. Lastly, when the interruption task is over, PTSG are reactivated during the Resumption step while the components of the interruption are inhibited, also generating potential interference. Successful resumption will depend on the level of activation of the PTSG at that moment and available cues in the environment.

Poster Presentation **Session A**

Consciousness of performance can be influenced by the nature of the task

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According to Kinsbourne, visuospatial tasks produce a contralateral attentional bias toward the left visual field (right hemisphere activation) and verbal tasks toward the right visual field (left hemisphere activation). Furthermore, he proposed that consciousness emerges from the highest activated neural networks. The goal of this study was to observe whether consciousness of performance could be influenced by the nature of the task. We designed two experiments with a two-alternative forced choice visual search task using lateralized stimuli. In the first experiment, the material used was visuospatial (three open squares with one target containing an opening on the top or the bottom). Participants had to indicate the orientation of the target using their right or left hand. In the second experiment with a different group, the material was verbal (two trigrams containing abstracts symbols and one, the target, containing one vowel or consonant). Participants had to indicate whether the target contained a vowel or a consonant using the right or left hand. After the experiments, all participants completed a self-rating scale to evaluate their performance. For each task, we computed multiple regressions using the performance for each visual field (left or right) and for each hand participants used (left or right) as independent variables and the subjective scales as the dependent variable. For the visuospatial task, only the left visual field/left hand condition could predict the estimated performance (B=1.02, SEM=0.38, t=2.69, $p<0.02$), whereas for the verbal task, only the right visual field/right hand condition showed such results (B=0.99, SEM=0.37, t=2.67, $p<0.02$). When using verbal material, the left hemisphere plays a role in the evaluation of performance, however when using visuospatial material, the right hemisphere seems to take charge of that part. Consciousness may indeed depend on the highest activation of neural networks and be influenced by the nature of the task.

Poster Presentation

Intentional attention switching between auditory stimulus levels

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The current project focuses on auditory selective attention to different stimulus levels – on a temporal scale – of the same auditory object. Tone sequences consisting of 9 different pitch tones in total were presented aurally. Thereby, 3 repetitive short 3-tone-patterns were combined to a long pattern. The patterns could be either rising or falling, independently for the short and the long time range, thus resulting of four different stimulus types: short and long temporal pattern rising (congruent), short and long temporal pattern falling (congruent), short pattern rising and long pattern falling (incongruent), or short pattern falling and long pattern rising (incongruent). Participants were informed by a cue if they had to respond to the short or the long pattern, and they indicated if the respective pattern was rising or falling by pressing one of two keys. We investigated intentional attention switches between the two time ranges. In two experiments, participants made fewer errors when attending to the long time range. In addition, we found switch costs when switching from the long time range to the short time range, but not when switching from the short to the long time range. These switch costs were reduced when participants had more time to prepare for the switch (in a condition with a prolonged cuestimulus interval). Participants responded more slowly and with more errors in incongruent trials, especially when they switched from the long to the short time range. To our knowledge, this is the first demonstration of intentional attention switch costs between temporal stimulus levels within the same auditory object. This study extends previous studies on intentional attention switches between two auditory objects and also provides further evidence for distinct processing patterns between short and long temporal ranges in auditory sequences.

Poster Presentation

Working memory and high-level cognition in children: The importance of individual titration of processing times in complex span tasks

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Research indicates that working memory (WM) increases with age and explains the continued development of high-level cognition (HLC) throughout childhood. However, children's HLC develops at varying rates and it is unclear how individual differences in WM can account for such discrepant ability. Previous studies demonstrate that generic temporal constraints placed on WM span tasks yield more predictive measures of HLC and, therefore, call into question the importance of maintenance strategies in the WM-HLC relationship. The current study investigated how WM in the numerical, phonological and visuospatial domains contributed to children's HLC. Unique computer-paced WM span tasks that accounted for individual differences in processing speed (i.e. providing more evenly distributed temporal constraints) were administered to ninety-two primary school children (aged seven- to eight-years). Performance in the computer-paced task was compared to that in an experimenter-led condition that was not time constrained. High-level cognition was assessed for non-verbal reasoning, reading and mathematics ability. Regression analysis demonstrated that, although span scores were comparable in both conditions, the predictive power of WM was dependent on administration method (i.e computer-paced or experimenter-led). Further analyses demonstrated that processing speed only explained the increased predictive power of computer-paced tasks dependent on domain and HLC measure. This suggested a difference in the influence of maintenance strategies on the relationship between WM and HLC. Furthermore, in the experimenter-led condition storage and processing accuracy differently explained variance, again, dependent on domain and HLC measure. Findings demonstrate that, when individual differences in processing speed are accounted for, there is a complex configuration of unique and shared variance dependent on domain, task experience and HLC. Furthermore, this variance is not explained solely by strategy affordance. The practical and theoretical implications of these results are discussed, along with suggestions for tasks that would provide opportunities for learning intervention studies.

Poster Presentation

Emotionally-arousing stimuli modulate visual search in real-life scenes irrespective of stress manipulation

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Previous literature suggests that acute stress may alter attention control by reducing top-down filtering with a consequent enhancement of bottom-up capture. Although emotional stimuli are thought to capture attention automatically in a bottom-up fashion, the impact of stress on attentional selection involving emotionally arousing stimuli is still largely unexplored. The aim of the present study is to investigate whether/how stress modulates top-down vs. bottom-up attention mechanisms. We used a visual search task employing real-life scenes (which include a high level of competition among objects), in which emotional elements (positive or negative) were either task-relevant or task-irrelevant (i.e., they were or they were not the current target to be searched for). We elicited stress through a "frustrating competition" procedure, in which participants repeatedly lose ("stress" group), or repeatedly win ("no-stress" group) at the visual search task against a fictitious player (i.e., faster search of the current target). We found that the stress manipulation affected the general strategy used to perform the visual search task, with stressed participants searching faster but less accurately for the target, irrespective of whether the target was emotional or neutral. This is in line with the idea that stress produces more automatic and less controlled responses. However, the stress manipulation did not elicit any differences in the pattern of emotional search: Irrespective of stress condition, participants were faster and more accurate in detecting task-relevant emotional objects than other neutral elements in the scene. Overall, these findings suggest that bottom-up attentional capture driven by emotional stimuli is resistant to stress manipulation.

Poster Presentation

Individual working memory capacity affects quantitatively but not qualitatively the deployment of attentional resources

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Working memory capacity (WMc) has been traditionally thoughts as involving a fixed number of objects that can be stored at a time ("slot" models). More recent models argued instead that WMc may be based on fixed resources, which can be divided according to the complexity of to-be-stored objects ("resources" models). Here we report evidence showing that both accounts can be valid. We presented participants with everyday pictures for a short period (4 secs). After a retention period of 8 s, we asked participants to verbally report as many objects/details as possible of the previous scenes. We then computed how many times the objects located at either the peak of maximal or minimal saliency in the scene (as indexed by a saliency-map) were recollected by participants. We also measured WMc (K score) using an independent visuo-spatial WM test, namely, the change location task. The results showed that high WMc (i.e., high K score) predicted the amount of objects successfully recollected, in line with a fixed-slot account of WMc. However, the current level of individual WMc failed to predict the probability to recollect maximal- vs. minimal-saliency objects in the scene. This indicates that the deployment of attention resources, within the individual number of fixed-slots, follows bottom-up capture by low-level sensory features (i.e., visual saliency). These findings are in line with the idea that memory representation in complex, real-life situations, can be driven by bottom-up, saliency-related factors that control the allocation of WM "resources" within "fixed" constraints operating at the individual level.

Poster Presentation

Cognitive and neural mechanisms involved in performance monitoring during sustained attention: a comparison of errors made with and without awareness

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The ability to maintain the focus of cognitive activity on a given stimulation source or task over extended periods of time, i.e. to sustain attention is a fundamental component of the cognitive capacities of human, and by extension critical for goal-directed behaviors (Sarter et al, 2001). Good sustained attention performance relies on the proper functioning of cognitive control mechanisms, including performance and error monitoring. Several ERPs and behavioral indices have been associated with error monitoring : the error-related negativity which is assumed to reflect processes related to the early detection and evaluation of an error (ERN; Gehring et al, 1993), the error positivity which is believed to index conscious aspects of error processing and may reflect the allocation of attention to an error (Pe; Ullsperger et al., 2010) and the "post error slowing", typically observed in the form of systematic slowing of response latencies for correct trials immediately following an error (Rabbit, 1966). Although a few recent studies have observed decreases in ERN amplitude with time-ontask (Boksem et al; 2006; Kato et al, 2009), no study have examined the time-on-task effects on ERN and Pe by distinguishing errors made with and without awareness. In this perspective, a group of young healthy subjects aged between 19 and 30 years, participated in this study. We used the Error Awareness Task (EAT, Hester et al., 2005), a motor Go/No-Go response inhibition task. The task lasted 68 minutes. For ERP and performance analysis, the task was divided into two periods of equal duration. Our preliminary results reveal a vigilance decrement (e.g. an increase of error rate with time-on-task), and a post-error slowing only for errors made with awareness. Differential time-on-task effects are highlighted on ERPs amplitude: the Pe remains stable throughout the task but the ERN increases independently of the type of error.

Poster Presentation

EEG effective connectivity during volitional and automatic affective regulation: Interactions between the prefrontal cortex and attentional systems

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Growing evidence shows that emotional control is based on simultaneously occurring automatic and volitional regulatory mechanisms. While the former relates to monitoring processes, which starts with a simple registration of sensory input, the later regards mostly to reappraisal – a cognitive strategy used to change the affective response of stimuli by reinterpreting its meaning. Prefrontal activations associated with both volitional and automatic control processes inhibit the activity of the emotion-related brain areas. However, little is known about how this control instance affects visual and attentional areas. The aim of this study was to identify effective connectivity patterns distinguishing the two forms of emotional control. Depending on experimental conditions, participants were asked either to positively reinterpret (reappraisal) or to passively watch (automatic control) emotionally arousing film clips. Using the effective connectivity EEG method (Directed Transfer Function) we examined communication patterns between different cortical regions. Successful reappraisal was mostly associated with increased top-down influences from the right dorsolateral prefrontal cortex (PFC) over attentional and perceptual areas, modulating the initial stages of emotional processing. Passively watching clips triggered monitoring processes with increased flows from attentional areas to the left dorsolateral PFC. Thus, the dorsolateral prefrontal control center may be characterized by apparent lateral specialization: while the right hemisphere is associated with voluntary control, the left one seems to be more associated with automatic monitoring processes. This study was supported by the National Science Centre under Grant DEC 2013/09/B/HS6/02662.

Poster Presentation

Enumerating subset items within the subitizing range among adults with developmental dyscalculia

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There are two types of "numbers" that can be perceived from the environment: subset numbers (e.g., perceiving "2" when two plates and one cup are displayed on a table) and the total number of items (e.g., perceiving "3" objects in the previous example). Recently it has been showed that counting subset items requires attentional recourses even within the subitizing range, since the relevant subset needs to be separated from the irrelevant items. The aim of the present study is to investigate the perception of subset items within the subitizing range among population with difficulties in arithmetic processing - participants with developmental dyscalculia (DD). The study included 17 adults with DD and 17 matched adults without learning disabilities. The participants were asked to perform an enumeration task of subset items within the subitizing range. The target items were presented in different conditions containing different number of distractors. Results showed that DD had a different pattern of enumerating subset items. They could gain less from the reduction of the number of distractors compared to controls. DD showed a less efficient enumeration process for subset items within the subitizing range than participants with no learning disabilities, and their perception was more inconsistent and "noisier". These findings enable better understanding of the difficulties characterizing dyscalculia.

Poster Presentation   **Session A**

Attention is attention: Temporal stability of attention capture effects

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It is known that visual attention can be captured either in a top-down way according to the observer's goal or in a bottom-up way by stimulus' properties. However, little is known about an individual's temporal stability of such effects. In our study we therefore analysed temporal stability of both attention capture effects. Using a visual search task, participants had to search for a colour-defined target and discriminate a stimulus inside the target (so-called "compound search"). Top-down matching distractors had the same colour as the searchedfor target matching the participant's top-down set. Non-matching distractors had a different colour than the target. In addition, we used no-distractor trials with only a colour target. Bottom-up capture was reflected in longer response times in trials with than without a non-matching distractor. Top-down capture was reflected in stronger interference by matching than non-matching distractors, with interference by matching distractors measured free of inter-trial priming. Our results suggest that both attention capture effects are relatively stable across time when measured with one week or four weeks intervals. Results are discussed in light of possible explanations of the capture effects.

Poster Presentation   **Session A**

The influence of reward on the excitability of primary motor cortex in the Simon task

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Reward is known to improve behavioral performance such as speeding up responses and increasing accuracy. The present experiment set out to examine the influence of reward on the excitability of M1 using transcranial magnetic stimulation (TMS). At the beginning of each trial, a cue was presented, indicating the prospect of (no) reward for fast and accurate responses on current trial. Subsequently, Simon stimuli were presented on which subjects needed to provide a left/right button press. TMS was applied over M1 500 ms after cue onset or 150 ms or 250 ms after target onset. Electromyography was obtained from the right first dorsal interossei (FDI) to record motor evoked potentials. Behavioral results revealed faster responses for rewarded trials compared to non-rewarded trials. The congruency effect was not modulated by reward. Motor evoked potentials after the reward cue revealed M1 suppression (lower excitability for reward compared to non-reward trials). After stimulus onset, reward trials resulted in selective (only for the involved response hand) increased excitability. The data suggest that the effect of reward is two-fold. First there is aspecific suppression of both motor cortices. This suppression has been described earlier and could be related to modulations in the signal to noise ratio. Second, there is specific increased excitability for the correct response hand. Both effects correlate moderately ($r=-.42$, $p= 0.12$), but partial correlations reveal that the general suppression is related to behavior while selective M1 activation is not.

Poster Presentation

Inhibition deficits in depressed mood – age matters

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Recent evidence suggests that depressed mood affects cognitive inhibition (i.e., the ability to resist to distractor interference). In our study, we investigated this claim in two age groups, a younger group (mean age 24.4 years) and an older group (mean age 69.6 years) drawn from a normal population. Furthermore, we were   interested whether impaired health status also goes along with reduced inhibition. We assessed depression with the Beck Depression Inventory (BDI, Hautzinger, Keller, & Kuhner, 2006) in both age groups and in addition with the Geriatric Depression Scale (GDS, Yesavage et al., 1983) in the older group. Health status was assessed with the SF-36 questionnaire (Bullinger & Kirchberger, 1998). Inhibition was measured in seven tasks and we computed an overall score across the tasks. We found no influence of overall BDI score on inhibition scores in young or older adults (N=124 and 148, respectively). The GDS score also had no significant influence on inhibition scores. More interestingly, the self-assessment of the ability to concentrate (BDI item 7) predicted overall inhibition performance in the younger sample only. In contrast, health status, namely mental health index suggested worse inhibition performance in the older sample only. In sum, our results show a coupling of inhibition with mental health in older participants, but not in younger participants. Regarding depression, our results confirm studies showing reduced inhibition in younger participants with lowered mood. However, they reveal a decoupling of inhibition from mood state in older age.

Poster Presentation   **Session A**

Anticipated emotional expression holds attention to faces in young children without autism but not in children with autism

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Disengaging one's attention from another person's face is slower in children without autism than in children with autism, suggesting weaker attentional engagement by faces in autism. The aim of this study was to investigate whether gaze direction and anticipated emotional expression affect attentional disengagement. Sixteen children (aged 3-5 years) with autism, 17 with developmental delay and 17 typically developing children participated in the study. In the practice phase, participants were shown faces of two persons and two toys and were told which one of the two persons would smile and which one of the two toys would move. In the actual experiment, participants were shown a centrally presented video of a neutral face or a still toy, followed by a peripheral distractor. Each face was displayed facing forwards with either a direct gaze or gaze down, or facing slightly sideways but maintaining a direct gaze towards the participant. When the participants reengaged their gaze back to the central face, the face designated as smiling started to smile whereas the other face did not smile (toy spinning or not). Disengagement and re-engagement gaze latencies were measured. The disengagement latencies were significantly longer for a face anticipated to smile compared to the nonsmiling face in both groups of children without autism but not in the children with autism. No differences were observed between the three groups regarding the moving vs. non-moving toys. Disengagement latencies tend to be longest for the head facing away with direct gaze. Re-engagement latencies in all groups were shorter for smiling than non-smiling faces indicating that the children could differentiate between the identities. The anticipation of emotional expression and possibly gaze direction influenced the disengagement latencies in children without autism. Attentional bias toward anticipated emotional expression was, however, absent in children with autism.

Poster Presentation

The role of working memory availability in auditory attentional capture

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According to load theory (Lavie et al., 2004), the availability of working memory (WM) resources is pivotal for maintaining task priorities and ignoring irrelevant information. For example, attentional capture (AC) by visual singleton distractors increases when WM availability is reduced (due to high (vs. low) load in a concurrent WM task; Lavie and de Fockert, 2005, 2006). Because singletons in the AC paradigm share no features with the target and thus provide no direct response competition, these findings imply that WM availability influences the perceptual processing of visual distractors, rather than response-level processing. However, it remains unknown whether WM availability also influences the perceptual processing of auditory distractors, because WM load modulations on auditory selective attention have only been demonstrated in response competition paradigms (Dalton et al., 2009). In order to test for effects of WM availability in the absence of response competition, the current study used an auditory AC paradigm. Participants responded according to the duration (long or short) of a target tone in a rapid sequence of nontarget tones of intermediate duration. On half of the trials, one of the nontargets – the singleton distractor – was presented with a unique frequency. Participants were asked to ignore the distractor due to its irrelevance to the task. While performing the AC task, participants maintained in memory a set of digits in ascending order (low WM load) or random order (high load). Unlike Dalton et al., we found no modulation by WM load of the interference associated with the singleton distractor. However, when response competition was introduced (by presenting the distractor with the same or opposite duration as the target), increased WM load did increase distractor interference. These findings suggest that modulations of auditory distractor interference by WM availability occur at the response level rather than the perceptual level.

Poster Presentation

Session A

Sustained attention ability affects language production performance in typical and developmentally impaired children

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Specific language impairment (SLI) was considered a purely linguistic deficit, but recently it has been shown that children with SLI also have attentional problems. Here we focus on their problems with sustained attention (SA): maintaining alertness over a period of time. First, we wished to compare SA across modalities, as there is consensus on impaired auditory attention but conflicting evidence on whether visual attention is also impaired. A second aim was to see whether SA ability can explain variation in language production performance, as some authors have suggested SA problems underlie impaired language skills. A group of 6-8 year olds with SLI (N=26) was compared to a group of typically developing (TD) children (N=22) on a picture naming (PN) task and two SA tasks: an auditory and a visual continuous performance task (ACPT, VCPT). Hit rate (correctly detected targets), false alarm rate (incorrect responses to non-targets), and reaction times (RTs) on the CPTs all showed worse performance for the SLI group compared to the TD group. Interestingly, SLI children's hit rate was higher on the VCPT than on the ACPT, whereas TD children showed the reverse pattern. All in all, these findings corroborate previous findings of impaired SA in children with SLI. This holds for both the auditory and visual domain, yet there is some evidence that the two systems are impaired to a different extent. Furthermore, to see whether SA could explain part of the language skills of children, performance on the CPTs was correlated with PN. Hit rate and RTs on both CPTs correlated with naming latencies, pointing to a role of SA, both auditory and visual, in language production of SLI and TD children. This suggests that therapists and teachers should not only focus on improving language skills but also on increasing the ability to maintain attention.

Poster Presentation

Improving cognitive control through implicit attention training

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Cognitive control - the ability to overcome automaticity when faced with conflicting response options - is crucial for adaptive behavior and is disrupted in several cognitive disorders. Various studies have shown that cognitive control can be improved through training using instructional protocols. Although effective in improving performance on the trained task, the explicit nature of such methods may compromise the longevity and generalizability of the acquired skills. In the present study, cognitive control was trained by using an implicit attentional training protocol. An arrow priming task was used on which conflict emerged between prime (e.g., a left pointing arrow) and target (e.g., a right pointing arrow) on 20% of the trials. Attention to the distracting prime was implicitly manipulated on a minority of the trials. Two groups were trained to either direct attention towards (Group 1) or away from (Group 2) a distracting prime on these trials, increasing (Group 1) or decreasing (Group 2) the vulnerability to conflict. Training effects were analyzed on the trained task with and without the attentional manipulation, and on a highly similar task (close transfer) and a more distinct task (far transfer). Results showed a smaller impact of the distracting prime on the trained task for Group 2, indicating that the attentional manipulation was effective. The effect was maintained on the same task without the attentional manipulation. This indicates that subjects continued to direct attention towards or away from the distracting prime, thereby changing their vulnerability to conflict, even in the absence of the attentional manipulation. No transfer effects were found on the other tasks. These results demonstrate that cognitive control can be effectively manipulated through implicit attentional training, although the acquired skill seems limited to the trained task. Nevertheless, implicit attentional training may be a promising avenue for populations with impaired cognitive control.

Poster Presentation

Effects of relative and absolute task strength on n – 2 repetition costs

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Recently, Grange and Juvina (2015) found decreasing n – 2 repetition costs with increasing practice. However, in their experiment, no differentiation between absolute and relative strength of the three tasks was possible because all tasks were practiced to the same degree. To further elucidate this issue, we designed a task switching experiment in which for one of the three tasks, the stimulus-response mappings changed during the course of the experiment. Replicating Grange and Juvina (2015), we found decreasing n – 2 repetition costs with increasing practice but no effect of the change of stimulus-response mappings. These results suggest that the relative strength of tasks has no effect on n – 2 repetition costs, at least when it is varied by changing response-related aspects of the task set.

Poster Presentation   Session A

Combining Signal Detection Theory and Situation Awareness Analysis to better understand how drivers process Road Hazards

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This work aims to contribute to the literature by applying Signal Detection Theory (SDT) and Situation Awareness (SA) analysis to Hazard Prediction Tasks. The novelty of this study is to provide several quantified measures of the processes involved in Hazard Prediction: Discrimination, Situation Awareness (recognition, location, projection) and Decision-Making. The videos stopped just before the actual hazard unfolded (impending hazards). These impending obstacles could represent a hazard (when a manoeuvre should be made to avoid the crash) or a quasi-hazard (the car could safely carry on driving at the same speed and through the same trajectory). Thus, the hazard and the quasi-hazard can be considered as the signal and the noise respectively and can be defined by the driving situation that finally occurs. The sample was comprised of 143 participants, 48 females and 94 males. An occlusion technique, whereby a video-clip would be suddenly occluded immediately prior to the onset of a hazard was used. The Multiple Choice Hazard Perception Test (MC-HP test) is a reliable instrument. Groups of non-offender drivers (learner, novice and experienced) and offender drivers (novice and experienced) were recruited. The videos were divided into two types of situation: hazardous situations (15 videos) and quasi-hazardous situations (5 videos). When analysing Hazard Prediction from the SDT perspective, it was found that experienced drivers show higher discrimination scores than learners or novices. In addition, non-offender experienced drivers show higher discrimination scores than offender drivers. The results also show that SA is dependent on driving experience, with experienced drivers obtaining higher scores in the HP Test than novice drivers or learner drivers, who obtained the lowest scores. Offenders have similar SA patterns of processing and understanding the information to those of non-offenders. On the other hand, no differences were found between participants on the decision-making parameter (beta).

Poster Presentation

Behavioral consequences of trait impulsiveness in the Stroop task

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Clinical studies link impulsive behavior to aggression, risk taking, substance abuse, and ADHD. According to Fowles (2000) individual differences in electrodermal activity (EDA) could be connected to the impulsivity dimension of antisocial personality, and may indicate a weak behavioral inhibition system. An ERP study of healthy subjects (Lansbergen et al., 2007) reported Stroop interference in terms of error rates and cortical functioning differences of those with high and low impulsivity. Aim of the present study was to collect behavioral measures in a cognitive inhibition task using a motivational context and explore differences related to trait impulsiveness. 184 subjects participated in a computerized Stroop task with EDA registration. Baseline session of this task was followed by a motivational session, where subjects were promised gifts if they were faster than their average baseline performance and made less than 5 errors. They completed the Hungarian adaptation of the Barratt Impulsiveness Scale. Error rates were similar in the baseline and the motivated sessions, and for those with impulsivity scores higher and lower than average. However, participants with high impulsivity made significantly more mistakes in the motivated session as compared to their baseline performance ($p < 0.05$). This was not true for those with low trait impulsivity. EDA of highs in the motivated session was significantly more elevated ($p < 0.001$, effect size: 24%), whereas there was only a trend (effect size: 3%) for lows. Reaction time did not reveal similar differences of highs and lows. Our results confirm previous findings of Lansbergen and colleagues: there are Stroop-performance differences of healthy participants with high and low trait impulsivity. However, present results including motivation refine these behavioral differences. Our findings on EDA also verify the link between impulsivity and a weak behavioral inhibition system as suggested by Fowles. This work was supported by the Hungarian Scientific Research Fund (OTKA K100845).

Poster Presentation   **Session A**

Use it or lose it? The case of temporal integration in aging

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As people age, their visual temporal resolution diminishes. They do worse in tasks involving gap detection or backward masking, for instance. Older adults also integrate successive visual stimuli over longer intervals than younger adults do. A contributing factor to this decline in temporal sensitivity could be that in vision, space is the principal dimension, rather than time. To draw a loose parallel with muscle atrophy; it might be that not using it (much) eventually leads to losing it. In audition, time is the principal dimension, and fine temporal resolution is required on a daily basis to process and understand speech. The primacy of time in audition could thus shield against the decline that is observed in vision. The evidence to date is mixed. Some studies show that older people also have less temporal resolution in audition, yet there are no studies indicating that auditory temporal integration is affected by aging. One psychophysical study even showed that the temporal integration interval might not change at all with age (Horvath et al., 2007). We sought to settle this issue by comparing visual and auditory temporal integration in younger and older adults directly, minimizing task differences between modalities. Participants were presented with a visual or an auditory rapid serial presentation task, at 40-100 ms/item. In both tasks, two subsequent targets were to be identified. Critically, these could be perceptually integrated and reported by the participants as such, providing a direct measure of temporal integration. In both modalities, older participants reported more integrations overall. There was also evidence for integration across longer time intervals with age in both modalities, as older participants integrated more frequently particularly at the longer 70 and 100 ms durations. Decline in temporal sensitivity in audition is thus similar to vision, despite the primacy of time in the former modality.

Poster Presentation

Reduced contrast sensitivity to predicted stimuli

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Self-generated stimuli are perceptually attenuated compared to externally generated stimuli both in terms of perceived intensity and discriminability between different intensities (e.g. contrast discrimination). Recently, repetition suppression, i.e. the decrease in neural activity that occurs when the same stimulus is repeated, has been proposed as a possible mechanism for this attenuation, suggesting that sensory attenuation may occur not just for self-generated stimuli but also for stimuli that are repeated. In the present study we tested this hypothesis using a repetition priming paradigm. We used a contrast discrimination protocol with Gabor gratings with two different orientations. Two Gabors, prime and target, were presented in succession, each lasting 200 ms, with a 100 ms blank in between. The participants' task was to discriminate between two different levels of contrast of the target. In a first experiment the prime and target had the same orientation (repetition) on 50% of trials and opposite orientation (alternation) on 50% trials. We found that contrast sensitivity is lower when the same orientation is repeated, suggesting a link between neural repetition suppression and sensory attenuation. However, this leaves open the question of whether sensory attenuation occurred because of repetition as such or because the stimulus identity was predicted. We addressed this in a second experiment where we had two blocks, a repetition block with 75% repetition trials and an alternation block with 75% alternation trials. In this case, we found higher contrast sensitivity on repetition trials compared to alternation trials in the alternation block. Since, in the alternation block, alternation was more frequent than repetition and could therefore be predicted, this suggests that when repetition is not expected, it is prediction, not repetition, that causes sensory attenuation. One possible mechanism that could explain this result is if unpredicted stimuli attract attention more strongly than predicted stimuli.

Poster Presentation

Effects of motor-cognitive coordination training and cardiovascular training on motor coordination and cognitive functions

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Many recent studies have shown that physical exercise can improve cognitive abilities: Physical training, particularly in the domain of cardiovascular training (e.g., running or swimming), resulted in improved cognitive performance from childhood to older age. While most previous studies focused on the efficacy of cardiovascular training, we examined and compared the effects of motor-cognitive coordination training and moderate cardiovascular training on cognitive functions. Given that previous studies found better performance on cognitive and motor-coordination tasks in professional athletes than in untrained non-athletes, we performed two separate training studies including physically active and sedentary participants, respectively. We tested 50 physically active (mean age = 23.5 years, SD = 3.2) and 56 sedentary participants (mean age = 23.4 years, SD = 3.2) in a pretest-training-posttest design with 12 sessions of moderate cardiovascular training (≈ 60% HRmax) or motor-cognitive coordination training. These training groups were compared to a passive control group. At pretest and posttest, participants performed an untrained motor-cognitive coordination task, measures of executive control (cognitive flexibility, inhibition, working memory), spatial ability, and fluid intelligence. We found training-related performance improvements in both the coordination training group and the cardiovascular training group. Physically active participants showed near transfer to an untrained coordination task in the coordination training group, but no transfer of training to cognitive measures. However, sedentary participants showed larger improvements in terms of inhibition in the coordination training group compared to the remaining groups, while the cardiovascular training group improved in cognitive flexibility compared to the remaining groups.

Poster Presentation   **Session A**

A modified stimulus set for examining the misinformation effect

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This study aimed to examine the validity of the modified version of the stimulus set for testing the misinformation effect which was developed by Takarangi et al. (2006). The modified narratives and memory test included not only the items asking about specific objects in the story but also about the temporal order of the segmented events of the story, while previous stimulus sets for testing the misinformation effect only dealt with the information about objects, such as brand name of soda and name of a tool. To examine if the new material could produce the misinformation effect, 72 subjects participated in this study. The procedure of the study followed the procedure used in Takarangi et al. (2006). The only different part from the original procedure was the narratives and the memory test given to the participants. The procedure included three stages; watching the story, reading the narratives, and performing the recognition (memory) test. In the results, the misinformation effect was found with the new material which means that participants were misled by the misinformation regardless of the misinformation type. Specifically, the participants who were given the temporal misinformation which is inconsistent with the original story were less accurate on the items asking the original temporal order of the events than ones who were not given the misinformation (4.86 v. 6.00; $t(70)=-3.475$, $p<.01$). The same pattern of accuracy was found when the misinformation was about the objects in the story (4.34 v. 6.05; $t(70)=5.795$, $p<.001$). It can be said that the modified narratives successfully produced the misinformation effect. The modified narratives and memory test would allow researchers to examine effects of the both types of misinformation about a story on memory distortion. This would contribute to improve the understanding of the misinformation effect.

Poster Presentation

Session A

Can transcranial electrical stimulation enhance the effects of working memory training?

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Accumulating evidence suggests that working memory training enhances performance on untrained memory tasks that are structurally similar to the training activities. However, there is little evidence that these improvements generalise to memory tasks that have a different structure to the training exercises. The primary goal of this study was to investigate whether the effects of training could be significantly enhanced by transcranial electrical stimulation (tES). In a double-blind randomised controlled study 30 healthy young adult participants received either active or sham stimulation applied bilaterally over the dorsolateral prefrontal cortex while completing 10 sessions of adaptive working memory training. In each training session participants trained on simple span tasks, which involved the immediate serial recall of stored items (e.g. digit recall), and on simple span tasks with intrinsic processing (working memory tasks). These required the transformation of the storage material prior to recall (e.g. backward digit recall). Transfer tests of simple span and simple span with intrinsic processing were completed by all participants. To test whether tES enhanced the generalisation of training effects to memory tasks with different structures to the training activities, participants also completed N-back tasks that required the continuous updating of a list of storage items, and complex span tasks in which processing episodes were interpolated between storage items. Our preliminary results reveal no group differences in gains on either the trained activities or transfer tests of memory that share overlapping processes with the trained tasks. Stimulation did, however, significantly enhance gains on a verbal N-back task beyond the effects of training alone suggesting that tES may promote the generalisation of training effects.

Poster Presentation

Relationships between planning ability and general cognitive ability in Russian adolescents

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Recent studies have established the relationship between general cognitive ability (g, intelligence) and various cognitive functions and characteristics, such as reaction time, inspection time, working memory. Intelligence manifests in complex behaviour which often involves step-by-step problem solving. We therefore suppose that there is a relationship between general cognitive ability and planning ability: higher intelligence may contribute to more efficient planning and problem solving.

The sample included 112 Russian adolescents (mean age 13.04 years, SD=2.35 years, 46% were male). General cognitive ability was assessed with the Raven's Standard Progressive Matrices (RPM). Planning ability was measured by means of the 'Stockings of Cabmridge' test from Cambridge Neuropsychological Test Automated Batery (CANTABeclipse).

We used Pearson correlation to evaluate the relationship between planning efficiency and intelligence indices, and one-way ANOVA to find out whether participants who use more efficient planning strategy have higher intelligence scores.

There were no statistically significant correlations between planning efficiency and intelligence indices. The highest correlation was 0.17 between planning efficiency and C sub-test score (p=0.074). The correlation between planning efficiency and RPM total score was 0.09 (p=0.351). The only statistically significant difference between strategy groups was for E sub-test (F[1,197]=3.958, p=0.048). Mean difference was 1.02 (2% of the variance) in favour of the efficient strategy group. The mean difference for RPM total score was 2.26 (about 1% of difference) in favour of the efficient strategy group, non-significant (F[1,221]=2.165, p=0.143).

We did not find any substantial relationship between planning efficiency and general cognitive ability. The weak relationship between planning efficiency and C sub-test score indicate that planning may contribute to discovering regularities in evolving patterns. The difference in E sub-test scores between strategy groups means that efficient planning strategy is important for solving complex cognitive problems which involves the search of the important features of the pattern.

Poster Presentation   **Session A**

How cognitive control modulates error processing

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Our responses slow down after we make an error. This phenomenon is known as the posterror slowing (PES) effect. It has been interpreted to be an indicator of behavioral adjustments that follow an incorrect response and, therefore, has been linked to cognitive control mechanisms. However, studies that demonstrate PES with reduced posterror accuracy challenge this idea. Inspired by the dual mechanisms of control (DMC) framework, the present study examined whether different control demands could explain variations in PES and in posterror accuracy. In two experiments, participants performed an arithmetic task while control demands were manipulated by an accuracy tracking procedure. We found that participants responded more slowly and less accurately after errors in all conditions. However, the reduction in performance was affected by the control demands of the task, as expressed by reduced differences in RT and accuracy when cognitive control requirements were high. By using the diffusion model, we were able to show that a demand for a higher degree of control increases cautious behavior after an error, but also prolongs irrelevant processing and impairs processing speed. Together the findings support the DMC framework by demonstrating a dynamic involvement of cognitive control in error processing, and offer a new approach for understanding the inconsistent findings regarding PES and posterror accuracy.

Poster Presentation   **Session A**

Disentangle contributions from working memory and intelligence to children's reading skillss

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The present study investigates the distinctive contributions of working memory and intelligence to reading among Greek speaking children. Sixty children participated in the study. Their intelligence was estimated with a task of expressive vocabulary and a non-verbal task. Their simple storage in working memory was assessed with a word list recall task and their complex working memory with a listening recall task. Children were also administered a reading fluency and a reading comprehension task including sentences and short texts. Vocabulary knowledge and simple verbal storage significantly predicted reading measures in the multiple regression analyses. Nevertheless, the complex storage revealed no predictive power, in contrast to evidence from studies with English peers. Finally, hierarchical regression analyses revealed both common and independent contributions of simple storage capacity and vocabulary knowledge to reading measures. Present findings are discussed in relation to children's age and the characteristics of Greek language, indicating the need for further cross-linguistic investigations.

Poster Presentation

Working memory and incidental memory :the study of distractors' status through a recognition task

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All the theories agree that working memory is capacity limited, but they differ in explaining this limit. Some theories assert that working memory representations suffer from temporal decay and interference, but that this forgetting can be counteracted by refreshing memory traces (TBRS; Barrouillet et al., 2004). Other theories deny any temporal decay or active refreshing of memory traces. Forgetting would result from interference between memory items and distractors, the deleterious effect of interference being counteracted by the active removal of distracting information through antilearning (SOB-CS ; Oberauer et al., 2012). There are two opposite conceptions in accounting for the cognitive load effect in complex span task. The TBRS model (Barrouillet et al., 2004) assumes that a low cognitive load involves better immediate recall due to the increased proportion of time available to refresh memory traces. The SOB-CS model (Oberauer et al., 2012) proposes a different explanation: low cognitive load allows more time to remove distractors, hence the better recall. A way to decide between these two hypotheses is to study the status of distractors through a recognition task. If participants use free time to remove distractors, a low cognitive load condition should result in poorer recognition of distractors because low cognitive load involves more time to clear working memory. We obtained results at odds with this prediction, suggesting that people do not use the available free time to remove distractors.

Poster Presentation

Session A

The impact of labels on the retention of visual information in working memory

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For researchers interested in the retention of visual information in working memory (WM), spontaneous labeling might confound the results through the unaccounted influence of verbal working memory. To prevent such influence, researchers often (but not always) require articulatory suppression (AS) – i.e., constant articulation – during the task. The question is, if there is any impact of verbalization on visual WM, what is the nature of this influence? We investigated this question using color as a test case. During a set of experiments, participants had to retain in WM the precise color of a sequence of discs in order to report them using a continuous color wheel. In Experiment 1., this task was performed under AS (continually repeating "bababa") or verbal labeling (VL; name the presented color as soon as possible) with different memory loads (1, 2, or 4 items). Performance was impaired by memory load, but verbal labeling counteracted this effect. Analyses of the distribution of response deviations in both conditions did not show any evidence of categorical responding being the source of the benefit. Moreover, mixture modeling showed an increase probability of remembering the items in the VL condition, with no effect on the fidelity of these representations (if anything, the trend was of improvement). In Experiment 2, we tested three alternative explanations of this benefit: increased attention due to the mere requirement to respond to memory items; increase in the distinctiveness of the items; or encoding to long-term memory. Four conditions were assessed: the AS and VL conditions – as in Experiment 1- as well as a condition requiring naming of the serial order (VP condition), and AS combined with a like-dislike decision (LTM condition). Only the VL condition benefited performance compared to the AS condition. These results suggest that labeling increases the capacity of visual WM.

Poster Presentation

Identifying the source of working memory impairments in children with maths and reading difficulties

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Specific impairments in visuo-spatial aspects of working memory are associated with mathematical difficulties that occur in the absence of poor reading skills (Scuzs, Devine, Soltesz, Nobes & Gabriel, 2013). In contrast, verbal-only working memory impairments are typical among children with specific reading difficulties (Swanson, Xinhau & Jerman, 2009). The extent to which these different profiles of working memory deficits represent fundamental difficulties in learning disorders is not well understood. Working memory relies on adequate sensory inputs and is part of a broad network of higher-order cognitive control functions, including inhibition and selective attention. Difficulties in any of these interfacing systems will impact on working memory performance. The primary aim of this study was to identify the potential source of working memory problems in children with mathematical difficulties and children with comorbid reading and maths problems. Twenty-seven children with specific maths difficulties, 16 children with comorbid reading and maths problems and a comparison group of 40 children with age-typical reading and maths abilities completed a battery of tasks designed to assess the cognitive processes associated with working memory. These included parallel verbal and visual tests of basic information processing, short-term memory, working memory, selective attention and inhibitory control. Our preliminary data suggest that children with specific mathematical difficulties have impairments in verbal aspects of working memory that may occur downstream of difficulties in phonological processing, while children with comorbid maths and reading difficulties have a broader profile of cognitive impairment that extends across verbal and visuo-spatial information processing, working memory and selective attention. These findings are discussed in terms of methods of improving academic outcomes in children with these different profiles of working memory impairment.

Poster Presentation **Session A**

Availability of working memory content in serial recognition task

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The research investigate mechanisms of availability of information stored in working memory (WM). Many theories suggest that retrieval from WM involve two processes – recollection and familiarity. One of many factors that affect the retrieval efficiency is the availability of memory content which fades in time. Low availability precludes recollection, but allows for the familiarity application. In the present study we used a WM search task with constant set size (6) and multiple target stimuli (T1 and T2) in order to investigate availability of WM content in serial recognition. Additionally we manipulated delay time between stimuli presentation and recognition (0, 1 and 3 sec). In order to check the subjective availability of the material, we asked participants how confident they are of their responses. The results show that the delay time does not affect accuracy (an objective indicator of availability) of the T1, and significantly reduces the availability of T2, but exclusively in the positive condition. Only in this condition, accuracy is accompanied by adequate evaluation of confidence. In the other conditions, subjects' confidence decreases with delay, while accuracy is constant and high. Similar differences were found between T1 and T2 accuracy level in the position effect: typical for T1 and almost flat for T2 when delay time was 3 sec. We discuss the obtained results in light of current models of WM.

Poster Presentation   **Session A**

The developmental trajectory of magnitude discrimination

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According to the Approximate Number System (ANS) theory, non-symbolic magnitude dimensions (discrete and continuous) are represented in a noisy manner that results in an approximation of a given magnitude. Moreover, in the ANS, discriminability of magnitudes complies with Weber's law so that in a magnitude comparison task, the relationship between the magnitude ratio and reaction time (RT) should be linear. The assumption that discriminability of all magnitudes complies with Weber's law has being questioned. It was found that when using a power function, in magnitude comparison task the relationship between discriminability and size ratio is not always linear. Namely, this relationship is modulated by the type of stimuli. While physical magnitude comparison results in a curve-linear fit, symbolic magnitudes comparison results in a linear fit. In this study we explored the developmental changes that occur in the ability to discriminate magnitudes in young children (1st, 3rd and 5th graders). We employed a power function to describe the relationship between magnitude ratio and RT in different magnitude comparison tasks (symbolic, continuous and discrete). Results indicated that for physical comparison, the linear-curvature pattern decreased with age (yet it remained curve-linear). For discrete comparison, the linear-curvature pattern increased with age (it changed from linear to curve-liner). For symbolic comparison, the pattern remained linear regardless of age. These results support previous findings indicating that the relationship between discriminability and magnitude ratio is not always linear. Furthermore, it can be argued that experience with symbolic magnitudes creates a change in non-symbolic magnitude representation.

Poster Presentation

Conceptual and Physical Magnitude Perception in Dyscalculic Subjects

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Developmental Dyscalculia (DD) is a learning disability which is manifested by difficulties in numerical and magnitude processing. Magnitude is a multi-dimensional concept which includes conceptual magnitudes (i.e., the internal representation of an object's size) and physical magnitudes (i.e., the perceived size of an object). The focus of this study was to examine automatic processing of conceptual magnitude in dyscalculic subjects. A common way to study automaticity is using conflict stimuli. In a conflict task stimuli contain two magnitude dimensions, conceptual and physical, which create congruent (e.g., a physically small sheep compared to a physically large lion) and incongruent (e.g., a physically large sheep compared to a physically small lion) conditions. The difference in reaction times between incongruent and congruent trials, (i.e., the congruity effect) is considered as a measure for automatic processing of the irrelevant dimension. In the current study, participants were instructed, in separate blocks, to respond to the larger object on the screen (i.e., physical magnitude) or in real life (i.e., conceptual magnitude). The results revealed that in the physical comparison, controls and DD responded in a similar manner. In contrast, in the conceptual comparison, the congruity effect of DD was larger suggesting that automatic processing of conceptual magnitude in DD is weaker. Our results fit with previous findings of weaker magnitude representation in dyscalculic subjects; and support theories of a shared neural substrate for different types of magnitude.

Poster Presentation

Numerosity extraction from visual sets: A temporal perspective

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Every day, humans demonstrate their ability to perceive and estimate numerosity at a glance. Yet, the mechanism by which one extracts it from a visual stimulus remains unclear. In particular, it is controversial whether our number sense is indeed based on number or not. Some authors posit that numerosity is a visual property that can be sensed directly. Others argue for an indirect hypothesis, namely, that we first need to extract information from visual cues (e.g. aggregate area, density). Furnishing empirical evidence that is liable for deciding between these hypotheses has been particularly difficult so far because of methodological issues resulting from the covariation between numerosity and non-numerical visual properties of a stimulus. To overcome these difficulties, we investigated the time course of numerosity extraction, by manipulating the stimulus exposure time. Since we focused on the role of aggregate area, participants had to perform comparison tasks based either on numerosity or on area. Congruency between area and numerosity was manipulated to study the influence of each dimension upon judgments on the other. Overall, we found that exposure time modulated both global performance and congruency effects. Durations that were needed to exceed chance level were shorter in the area task than in the numerosity task (33 and 50ms respectively). Furthermore, a significant congruency effect was already present at 33ms in the numerosity task, showing an immediate effect of area on numerosity judgments. By contrast, for the area task, only late and marginally significant interference of numerosity was observed. However, clear and significant congruency effects were found for both tasks when exposure time was unlimited (Experiment II). At first glance, the results seem compatible with the indirect hypothesis. Yet, they also indicate that the influence of non-numerical visual cues on numerosity and area judgments is complex and varies with exposure time.

Poster Presentation

On the importance to consider the presentation mode for examining basic magnitude processing in mathematical learning disability : Evidence from the Turner syndrome

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Mathematical development is assumed to depend on the ability to represent numerical magnitudes. For now, researches on mathematics learning disability have mainly focused on the ability to represent visual numerosities which requires efficient visuo-perceptual skills to extract numerical information from visual stimuli. The aim of this study was to explore how visuo-spatial processing influences different kind of basic magnitude processing. Twenty female participants with Turner syndrome presenting a specific cognitive profile with low math and low spatial skills and twenty control subjects matched for verbal IQ, age and education were administered magnitude comparison tasks with various visuo-spatial requirement (auditory / low visuo-spatial / high visuo-spatial information requirement) and different kind of quantitative stimuli (continuous vs. discrete non-symbolic vs. symbolic magnitudes). First, we observed a specific deficit in continuous processing for visual information (length comparison), directly related to the visuo-spatial disability described in the syndrome. On the other hand, group with Turner syndrome showed abnormal acuity in both visual and auditory comparison tasks with stimuli presented sequentially (estimation of flashed dots and sounds) while there was no difference between the two groups for a non-symbolic task requiring high visuo-spatial abilities (collection comparison). This study suggest that lower ability to process numerical stimuli in Turner syndrome does not seem to be the consequence of their visuo-spatial impairment but could rather be due to difficulty while extracting numerosity through a sequential presentation. On the other hand, this study highlights the importance to consider the specificity of the sequential magnitude presentation in mathematical abilities.

Poster Presentation

Integration of visuo-spatial information

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In two experiments we examined whether people integrate visuo-spatial information they encode across different experiences into a single representation at the time of encoding or whether they maintain separate representations until the time of retrieval, when the task requires them to relate information across representations. Participants learned two layouts of 3 objects each placed around them either from the same or from different viewpoints. Then, participants carried out a series of pointing trials involving objects from either the same or different layouts (e.g., "imagine facing the ball, point to the pot"). Results showed that pointing error was lower for same compared to different layout judgments. Latency was equal for same and different layout judgments regardless of the study viewpoint, but this was the case only when participants refreshed their memory for the layout studied first before testing (Experiment 1). However, when memory refreshment of the first layout was eliminated (Experiment 2) participants were faster for same compared to different layout judgments, only when they studied the two layouts from different viewpoints. The current set of experiments has provided evidence that people readily integrate visuo-spatial memories they encode cross different experiences to a single memory representation at the time of encoding when doing so is easy and presumably useful for the task in hand. Even in those cases though, the resulting representation is not as precise as the representations corresponding to each separate experience.

Poster Presentation **Session A**

See that number? The role of visuospatial abilities and brain stimulation in symbolic numerical learning

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Visuospatial abilities (e.g., mental rotation) have been linked to strength of basic numerical representations. However, the causality of this link is still uncertain; to what extent does the ability to recognise and visuospatially manipulate number symbols help us to learn their semantic (ordinal or magnitude) values? Therefore, this experiment tested mental rotation ability and visual symbol recognition ability in a group of 79 adults before and after they undertook intensive multi-day training paradigms to learn novel numerical symbols. 40 of these participants received transcranial random noise stimulation (TRNS), a form of noninvasive electrical neuroenhancement, to either parietal or occipital cortices during learning. Stimulation did not affect mental rotation or visual symbol recognition. However, learning rate of the symbols correlated with a pre-test of 3D (but not 2D) mental rotation, as well as with symbol recognition ability measured after, but not before, training of the symbols' relative magnitudes. Similarly, a measure of numerical representation strength (numerical distance effect) in the symbols correlated with symbol recognition after, but not before, training. Importantly, the measure of numerical distance effect cancels out the contribution of visual processing to performance. Therefore, these results are interpreted as suggesting that greater visual recognition of symbols may play a role in forming stronger numerical representation when learning novel numerical symbols.

Poster Presentation

Cognitive training through mental-rotation tests? The effect of administering a paper-and-pencil and a chronometric test one after another

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In psychometric mental-rotation tests (e.g. MRT by Vandenberg & Kuse, 1978), large gender differences favoring males are generally found. Smaller gender differences typically appear in chronometric (computerbased) mental-rotation tests. Besides other influences, experience and training are supposed to be responsible for these gender differences. To examine the training effects of different test forms, 101 subjects (54 females and 47 males; mean age: 21.6) were administered a paper-and-pencil and a chronometric mental-rotation test one after another; the sequence was systematically varied. Error rate (ER) for both test forms and reaction time (RT) and rotational speed (RS) only for the chronometric test were used as measures of mental-rotation performance.

Results showed a significant gender difference in error rate in the paper-and-pencil test favoring males ($F(1, 97)=8.402$, $p<.01$, $\eta 2=.08$) but not in the chronometric test. In addition, there was a main effect of the testing sequence ($F(1, 97)=12.552$, $p=.001$, $\eta 2=.115$): Participants performed better in the psychometric test when they had been administered the chronometric test beforehand. There was neither a significant interaction between gender and testing sequence for the psychometric test nor for the chronometric test performance. Furthermore, there was a significant effect of the testing sequence for rotational speed ($F(1,97)=4.608$; $p=.034$; $\square 2=.045$): RS in the chronometric test increased when participants had been administered the paper-andpencil test in advance. The same effect was found in tendency for reaction time: RT decreased ($F(1,97)=3.525$; $p=.063$; $\square 2=.035$) due to the experience with the paper-and-pencil test. The study provides evidence for a general cognitive training effect on mental rotation by repeated testing. However, results also show that the training effects of chronometric and psychometric mental-rotation tests differ qualitatively. While the training with a chronometric test mainly influences error rate, the initial experience with a paper-and-pencil test seems to influence rotational speed.

Poster Presentation

Mental manipulation during maze solving

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Spatial ability involves mental visualization and manipulation of objects and of the environment. This ability has been found to influence a range of mathematical and scientific achievements. Spatial skills are not considered to be a unitary ability but rather composed of several dimensions. Thus, there are a variety of tasks used to assess spatial abilities and effects of training. The maze solving task is traditionally used to examine problem solving and executive functions. Recently this task has been used to measure planning and spatial map navigation. We hypothesized that mental manipulation of imagined objects and spatial map navigation share similar cognitive mechanisms. To this end, we used two visualization tasks (paper folding task and mental clock) to predict performance in the maze solving task. The results indicate shared variance among the three tasks, such that the resulting regression equation permits prediction of maze performance from scores on tasks of paper folding and mental clock. Our findings suggest that counter-intuitively, mental manipulation improves performance even in tasks that are traditionally not considered to involve visualization and manipulation.

Poster Presentation

Mental rotation in Autism Spectrum Disorder: A review

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Autism Spectrum Disorder (ASD) is characterized by difficulties with social interaction and communication, stereotyped patterns of behavior, and may be accompanied by language impairment (APA 2000; DSM-V). Despite these deficits, autistic individuals often display superior performance on some types of tasks, with visuo-spatial skills as one of the peaks in the ASD cognitive profile. Yet, a central visuospatial cognitive function, mental rotation, has so far received little attention in autism research. The current review presents an overview of the few existing studies that compare performance of ASD individuals and typically developing controls (TD) on different mental rotation tasks. Systematic search in the PubMed database for ('autism' OR 'ASD') AND ('mental rotation') revealed 11 samples of experimental studies, and 1 sample of meta-analyses. Careful examination of the reports revealed that the great majority of experimental studies used either pictures of two-dimensional letters or hand-shapes, or three-dimensional Shepard and Metzler (1971) shapes, whereas almost none of the studies used images of common objects. Participants were either adults or adolescents in the majority of cases, from a wide age-range. Some of the studies observed superior mental rotation skills in the ASD group while others did not. A meta-analysis found no consistent superiority in the intercept analyses and a slight inferiority in the analysis of slopes. We believe that this controversy is due to the experimental design: e.g. lack of systematic comparison between mental rotation of two- and three-dimensional objects, or between different types of objects.

Poster Presentation   **Session A**

The unity of the senses: Infants' cortical responses to audio-visual looming

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Integration of information from multiple senses is fundamental to perception, but when, where and how this is accomplished in the developing brain is not well understood. This study examined the timing and topography of cortical audiovisual interactions using high-density EEG during an audiovisual looming task in which the structure of the presented auditory and visual information is kept constant. Fourteen infants between the ages of 3 and 4 months participated in the study. The aim was to study how audiovisual looming is picked up by the infant brain and to determine what timing strategies are used to do so. Analysis was performed on all EEG trials in which a looming-related Visual Evoked Potential or Auditory Evoked Potential peak was detected. Results indicated that infants significantly showed earlier looming-related brain responses to the auditory loom than to the visual loom. The results further showed that infants used the less sophisticated visual angle/pitch and velocity timing strategies resulting in errors in judging the loom's timeto- collision as they are dependent on the approach velocity of the loom. Three infants, however, had developed a more advanced strategy which was based on timing their responses to the time-to-collision of the approaching audiovisual loom, but only when timing the collision of the visual loom and not the auditory loom. In conclusion, it was suggested that audiovisual integration was heavily influenced by infants' spatial attention captured by the visual loom which resulted in looming-related VEPs that occurred relatively late in the looming sequence. Infants' response asymmetry was also suggested to represent an evolutionary bias for survival which prioritizes an early auditory response over that of the visual in audiovisual looming perception. The use of less sophisticated timing strategies reflected infants' levels of neural maturity and locomotion experience, two very important factors needed for accurate timing of looming.

Poster Presentation

Voluntary action and the unity of perceptual experience: action-outcome associations promote audiovisual integration

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To form and maintain a coherent representation of the objects in our environment the brain must be able to temporally integrate the various sensory signals from these objects. For example, a difference between auditory and visual processing times mean that dynamic recalibration of audiovisual simultaneity may be needed. Here we investigate the relationship between voluntary action and such recalibration mechanisms.

Actions have previously been reported to influence perceived time in several ways. However, their role in temporal recalibration processes is still poorly understood and its understanding would provide important insights into the role of actions on multisensory integration. Participants learned the relation between a left or right hand action and one of two different audiovisual pairs. Following one of the actions, the auditory component of the pair led the visual component, while for the other action audio lagged vision. In a subsequent test phase, audio and visual components of these audiovisual pairs were presented at different onset asynchronies, and participants judged whether they were simultaneous or not. Crucially, each action in the test phase could trigger either the same audiovisual pair that had previously been associated with that action in the learning phase ("associated outcomes"), or the audiovisual pair that had previously been associated with the other hand's action ("not-associated outcomes"). We observed that audiovisual recalibration of simultaneity occurred only for associated audiovisual paired outcomes and not for not-associated outcomes. This suggests
that causal learning about action-outcome relations promotes temporal integration of audio and visual eventsinto a composite, temporally coherent audiovisual object.

Poster Presentation

Early visual processing of words and objects as revealed by masked priming

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Models of the visual identification of words and objects suggest the existence of similarities in the early processes triggered by these two types of visual objects. However, we are not aware of any direct comparison between these two domains. This work aimed at filling this gap by using the incremental masked priming paradigm. Four different experiments were conducted, each including the same 28 target words and their corresponding objects (represented by line drawings). In each experiment, targets were preceded by a related prime presented for 12, 36, 48 or 59 ms. Primes were forward masked with a string of hash marks (words) or a high–density grid (objects). The 12–ms condition was taken as a baseline, i.e., no control prime was used. In Experiment 1, 96 participants were engaged in a lexical decision task with repetition primes (e.g., cat–cat). In Experiment 2, 39 participants were involved in the same task with semantic primes (e.g., dog–cat). Experiment 3 involved 41 participants in a semantic decision task with repetition primes. Finally, 38 participants made semantic decisions with semantic primes in Experiment 4. Once the intrinsically higher variance brought about by objects was partialled out from the analyses, results were always identical across words and objects: Experiment 1 confirmed a strong repetition priming effect in lexical decision; Experiment 2 showed no semantic priming in lexical decision; Experiment 3 showed a strong repetition priming effect in the semantic decision task; and Experiment 4 showed a weak, but reliable semantic priming in the semantic decision task. These data suggest symmetrical early recognition processes between the two domains. Another interesting result is that, independently of the primes, response times were shorter for words in lexical decision, but for objects in semantic decision (despite identical targets) — objects seem to allow quicker access to semantics.

Poster Presentation   **Session A**

Visual Recognition Memory in Adolescents: Gender and Age Differences

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Memory is one of the most important cognitive functions which ensures unity and integrity of human behavior. Memory consists of a number of different entities relying on different brain systems. Investigation of unique features of visual recognition memory is particularly interesting due to the fact that it contributes to a broader understanding of memory mechanisms in general. The main goal of our study is to investigate the features of visual recognition memory in adolescents. For this purpose, we used the "Pattern recognition memory" (PRM) test from the battery of neuropsychological tests CANTAB "Eclipse". This test measures the ability to recognize a previously presented abstract pattern from two adjacent stimuli. The sample included 343 adolescents, aged from 10 to 17 years (mean age was 12.9 years and standard deviation was 2.19 years). We used ANOVA to estimate gender and age differences in visual recognition memory. The results show that there are no gender differences in visual recognition memory (data from 173 boys and 170 girls were compared). At the same time, we found age differences in latency of visual recognition memory. The sample was divided into three groups: adolescents from 10 to 11, from 12 to 14 and from 15 to 17 years old. Bonferroni adjustment for multiple comparisons was used. Younger children spend more time to respond correctly than children from two older groups ($F_{[2,340]} = 10.965$, $p = 0.001$, $\eta2 = 0.061$). Age-related differences for the general measure of visual recognition memory were not found. Our study shows that individual differences in performance of children's visual recognition memory cannot be accounted for gender and age. However, we found that reaction time for recognition visual pattern varies across adolescents. In the future research we are planning to investigate the contribution of genes to visual recognition memory.

Poster Presentation   **Session A**

Features of acoustic stimuli modulate late auditory responses during an electroencephalogram

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Acoustic stimulation of the auditory system, elicits transient event-related potentials (ERP) measurable in an electroencephalogram (EEG), as a response to features of a sound. The onset of an acoustic event elicits theenergy-onset response (EOR), whereas the onset of motion, in an otherwise continuous sound, elicits the motion-onset response (MOR). Other than the mode, other distinct features of the stimulus (some of which are frequency level, motion direction, velocity) have an effect on the amplitude, latency and cortical distribution of these responses. The current study investigates the influence of motion direction (stimulus moving towards midline versus towards periphery) and the frequency of the stimulus (low versus high) on E/MOR responses measured over the cortical hemispheres. Sounds with a change of mode (from stationary to moving and vice versa) and a constant mode (only-stationary or only-moving throughout the whole duration of the stimulus) were presented in a semi-circular free-field. Iin a two-alternative forced choice paradigm, participants were required to indicate whether they perceived a mode-change with a press of a button. Results showed that low frequency elicits higher amplitudes at the electrode sites of the midline, whereas high frequency at the ones of the left hemisphere, contradicting previous studies supporting the left-hemispheric dominance of low frequency processing. At the right cortical hemisphere, higher amplitudes were elicited from stimuli coming from the opposite (left) hemispace, supporting previous studies showing a pattern of contralaterality processing of the auditory system. Lastly, earlier latencies of the response were observed for stimuli within right hemispace, from sounds moving towards the midline, than moving towards the lateral, whereas for stimulation within the left hemispace, the opposite effect was observed.

Poster Presentation

Temporal cognition had a larger effect on spatial cognition rather than vice versa even in human vision, when spatial task was more difficult than temporal task

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There are cognitive interactions and similarities between three domains; space, time, and number. Spatial cognition affects time cognition: the shorter the line length is, the shorter the exposure duration perceived and vice versa. Time cognition also affects space cognition: the longer the exposure duration, the longer the line length is perceived and vice versa. Several previous studies have repeatedly shown that space-time interactions in human vision are asymmetrical; spatial cognition has a larger effect on temporal cognition rather than vice versa (Merritt et al., 2010). However, Cai and Connell (2015) showed that spatial information from haptic perception can be affected by temporal information from audition but not vice versa. In this study, participants were asked to judge exposure duration of lines that varied in length or to judge the lengths of the lines within different exposure time. Even in human vision, the balance between space-time interactions could be reversed; temporal cognition had a larger effect on spatial cognition rather than vice versa, when spatial task was significantly more difficult than temporal task. The result indicated that the saliency of stimuli could affect the balance of interactions. The higher salience task-irrelevant stimuli would affect discrimination more than the lower ones.

Poster Presentation

The role of awareness in motion perception: important but not necessary

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One of the most intriguing questions is how awareness influences the processing of visual information. Conscious access to the properties of physical stimulation is considered to be a crucial factor in determining perception. However, their exact relationship remains elusive. One way to address this issue is to control whether perceptual aftereffects are fully developed once awareness is abolished during adaptation. Here, we manipulate the visibility of the adapting stimuli using crowding to investigate how diminution of awareness acts upon the magnitude of the dynamic motion aftereffect (MAE). Random dots displays, moving at various levels of coherence served as target, flanking, and adapting stimuli. Psychometric measurements were based upon the observers' performance on a directional motion discrimination task. Our results showed that crowding severely impaired motion discrimination ability and significantly reduced MAE, but to a lesser extent (full adaptation condition). To further examine the interaction of perceptual and physical attributes of stimulation with perception, we measured MAE using perceptually similar and physically identical stimuli in high and low visibility adaptation conditions under crowding and no crowding. In the high visibility condition, MAE is stronger under crowding in both cases, indicating that both perceptual and physical factors modulate the final perceptual outcome. In addition, MAE, even though weakened, still persists in the low visibility condition, suggesting that awareness is crucial but not necessary for the perceptual aftereffect to occur. For future research, we aim to investigate the interaction of attention and awareness in the development of MAE, in order to disentangle their influence on perception.

Poster Presentation

Adaptation to translating dots reveals direction and orientation effects: Evidence for motion streaks

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Using a long series of rapid motion trials, we investigated short-term adaptation using inter-trial analysis. In Experiment 1, observers viewed 200ms of translating dots with directions jittered around vertical and indicated whether the direction appeared leftwards or rightwards. Responses showed subjective vertical was very accurate with a tight bandwidth. In an inter-trial analysis, response distributions for current trial (t) were recompiled based on the preceding trial's (t-1) direction. This revealed clear inter-trial adaptation: for small negative directions (1.5° & 3°) on trial t-1, distributions shifted positively, and small positive directions on t-1 shifted distributions negatively. This is the classical repulsive aftereffect pattern. For larger t-1 directions, adaptation effects were attractive. This mixed pattern suggests orientation and motion both contribute adaptation to translating dots. Experiment 2 aimed to isolate the orientation component by interleaving upward/downward motions, each jittered around vertical. Because direction-selective neurons have a preferred direction and a null response to motion 180° opposite (whereas responses to streak orientation are the same at 0° or 180°), interleaving up/down motion cannot produce inter-trial motion adaptation, but will produce inter-trial orientation adaptation. The inter-trial analysis revealed much stronger and broadly tuned adaptation, and all effects were attractive. We attribute the strong attractive effects to motion streaks, the oriented 'trails' produced by neural temporal integration in orientation units. Experiment 3 aimed to isolate the motion component by interleaving dot motion and grating motion. Translating gratings contain no streak information so cannot produce inter-trial orientation adaptation, only motion adaptation. The inter-trial analysis revealed narrowly tuned repulsive adaptation which we attribute to motion adaptation. Overall, fast dot motion contains motion and orientation components (Experiment 1). Up/down interleaving isolates orientation (Experiment 2), and interleaving dot motion/grating motion isolates motion (Experiment 3). Both components show inter-trial adaptation and are summed when fast dot motion is used.

Poster Presentation   **Session A**

Localizing cortical sources of ERPs related to binocular facilitation

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Source analysis were used on ERP data to examine cortical activity that underlies binocular facilitation. 12 participants took part in three viewing conditions (with the dominant eye, the nondominant eye, and both eyes). The young participants (mean age 23.6 years, SD 1.7 years) with corrected refractive errors and no binocular disorders were examined. During the blocks visual stimuli was presented on the CRT screen at a distance of 114 cm from the participant. A black-white reversed pattern with squares (small squares 15 min. of arc. with high contrast and large squares 60 min. of arc. with low contrast) was displayed with a frequency of 1 Hz. This was done to examine the contribution of parvo- and magnocellular pathways. EEG activity was measured from 64 channels (Quick Amp). On the basis of PCA, the locations and activities of four symmetrical pairs of regional sources were estimated with BESA (RV=0.50%), which resulted in a solution with sources in the cuneus, calcarine sulcus , the fusiform gyrus and the claustrum – frontal lobe. Binocular facilitation with small high contrast stimuli was observed in the calcarine sulcus, the cuneus and the fusiform gyrus, but mainly in early time windows (80 – 120 ms). Additionally, strong binocular effects were found in later time windows in the fusiform gyrus and the frontal claustrum. Similar results were occurred with large low contrast stimuli, but with stronger activity in dorsal than ventral visual stream. Importantly, our data indicate that binocular facilitation is not restricted to the striate visual cortex, but extra-striate and frontal brain regions are also involved in the integration of information from both eyes.

Poster Presentation

Effective adaptation to foreign accents due to high variability in own production output

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Adaptation to foreign-accented speech is fast for L1 listeners (Clarke & Garret, 2004). For L2 listeners, we know that foreign accented speech from L2 talkers matching the listener's own native language background can be as easy to comprehend as speech from native talkers of that language (Bent & Bradlow, 2003). Does this effect mainly reflect exposure to other L2 talkers with an accent similar to our own accent or is it driven by our own personal L2 speech production? We compared the effects of accent production with those of accent listening on the comprehension of accented L2 speech in a training-test paradigm. 60 L1 speakers of English and 72 L2 German learners of English first either listened to an English short story in which every instance of the voiceless dental fricative ('th') was replaced with a /t/ (e.g., 'throw' became 'trow'), or they read the story with the same mispronunciation out loud, or they were not exposed to the story. Neither the L1 nor L2 participants had previous production experience with the particular accent marker. During test, all participants made auditory lexical decisions to English single words with these substitutions. L2 listeners' RTs to words from the exposure phase were significantly faster after having produced the story than after no exposure (p=.018), whereas having listened to the short story also resulted in faster RTs than without exposure, but less strongly so (p=.18). For L1 listeners, the facilitatory effect of exposure did not differ significantly between production and listen exposure. Thus, L2 listeners but not L1 listeners were mainly affected by their own accent productions. Within talker variation of L2 talkers is larger than that of L1 talkers (e.g., Wade et al., 2007). Possibly, this regular experience with producing variable speech causes stronger adaptation effects from production output for L2 learners.

Poster Presentation

Effect of domain and processing level on perceptual bistability

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There is a controversy in the literature as to whether spontaneous perceptual switching in the visual and auditory perception is domain specific or domain general. Moreover, studies do not take into account that different stimuli give rise to competition between aspects of the alternative perceptions (e.g. form/content or direction of motion) that depends on processing at higher or lower levels of the perceptual hierarchy. In the current study we investigated the question of domain generality/specificity in switching patterns in both visual and auditory tasks, with different categories of bistable stimuli: auditory streaming and ambiguous figure from motion (low level feature rivalry), and verbal transformations and duck/rabbit ambiguous figure (high level content rivalry). Participants' switching patterns (N=81) were measured across five one minute blocks. We also examined whether executive functions (inhibitory capacity, set-shifting) and creativity relate to perceptual switching and whether there are idiosyncratic switching patterns for each individual. Switching rates were affected by processing level in both the visual and auditory stimuli. Specifically, higher level stimuli had higher switching rates than the low level stimuli. Further, participants were much faster to establish an initial interpretation for the high level stimuli and took less time to make their first perceptual switch. Moreover, some task specific correlations emerged with inhibition and creativity. However, in contrast to recent reports we did not find idiosyncratic switching patterns. In conclusion, the level of processing has a strong effect on the switching patterns both in auditory and visual bistable stimuli.

Poster Presentation

Egocentric interference from self-perspective and cool versus hot executive function

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Previous studies show that an egocentric bias to impute to others one's own point of view is not confined to childhood, but it is also evident in the judgments of adults. The suppression of one's own point of view seems to be a necessary condition of taking the perspective of another person. On this basis, it can be expected that the efficiency of taking someone's perspective will be associated with the level of executive function (EF). In the two studies a relationship between a visual perspective-taking and hot vs. cold aspects of EF has been examined. In both studies a computerized version of Keysar's task (Dumontheil et al., 2010) was used in which the participants had to perform commands in two conditions differing as to whether it was necessary to take into account the visual perspective of another person. In a study 1 (N = 53; M = 25.6) two measures of hot aspects of EF were used: Delay Discounting Procedure (DDP) and Iowa Gambling Task (IGT). It was found a significant moderate relationship between performance on the perspective-taking condition of Keysar's task and the last 10 trials in the IGT. There were no significant relationships with the control condition of Keysar's task. In a follow-up study 2 a subsample (N = 29; M = 25.4) from a study 1 completed two additional tasks, Stockings of Cambridge (SOC) and Intra-Extra Dimensional Set Shift (IED), tapping cool aspects of EF. It was found that planning skills (SOC) were only related to performance on the perspective-taking condition of Keysar's task, but attentional flexibility (IED) to performance on both conditions of this task. The results suggest that both cold and hot selected aspects of EF are engaged in visual perspective-taking. [This work was supported by grant no. 2011/03/N/HS6/02135 from the National Science Centre].

Poster Presentation

Session A

Face and object visual processing linked to literacy: a longitudinal study

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Reading is a cultural invention too recent to involve dedicated genetic or developmental mechanisms. It has been proposed that reading partly recycles pre-existing brain systems (neural recycling hypothesis, Dehaene, 2004). This hypothesis is supported by fMRI studies. Reading acquisition does not only lead to the development of a strong response to written materials in the left fusiform gyrus, the "visual word form area" (VWFA, Cohen et al., 2000; Dehaene & Cohen, 2011), but also reorganizes the ventral visual system: it competes with the cortical representation of other visual objects, especially faces, with less left and more right fusiform activation to faces in literates compared to illiterates (Dehaene et al., 2010). However, little is known about the behavioural consequences of this brain reorganization. How is face processing affected by literacy? One possibility could be that the stronger right-hemispheric lateralization for face processing in literates implies more holistic processing of faces. Alternatively, literacy may lead to a dynamic and flexible tuning of face processing (Harris & Aguirre, 2010). As a result, the depth with which a face is holistically encoded could depend on the nature of the task (Gao, Flevaris, Robertson & Bentin, 2011). To examine these possibilities, nine adult illiterate females participated in a longitudinal study in which they were offered an intensive alphabetization course for three months. Meanwhile, the evolution of reading skills as well as their memory for and sensitivity to configural vs. local properties of faces (and other objects) was measured. Participants were tested five times: two times before starting the literacy classes (pre-tests), two during the literacy classes, and finally after they completed the course. Results will be presented at the conference.

Poster Presentation   **Session A**

Interference effects on self and other Level-1/Level-2 perspective-taking. Are there relationships with mindreading abilities?

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The aim of the research was to examine potential links between two types of interference effects (altercentric and egocentric) in Level-1/Level-2 visual perspective-taking (VPT) and mindreading abilities in children and adults. It was hypothesized that only egocentric, but not altercentric, interference would be negatively associated with mindreading abilities and that this pattern of relationships would occur in Level-2, but not Level-1, perspective-taking. An additional objective was to test whether altercentric interference is only limited to Level-1 perspective-taking. Thirty-six typically developing children (aged 6–9) and 36 adults (aged 19-34) completed a computerized task with level of VPT (Level-1/Level-2), type of perspective (Self/Other), and type of stimulus (Consistent/Inconsistent) as independent variables. We measured reaction times and accuracy of responses to target stimuli presented together with faces of people peering into one of the two threedimensional target objects. Mindreading abilities were assessed using Happe's (1994) Strange Stories. The study showed that in Level-1 VPT altercentric interference occurred in children only. None of the groups revealed significant egocentric interference in Level-1 VPT. However, there was both egocentric and altercentric interference, with the former greater than the latter, in Level-2 VPT. Mindreading abilities in children and adults were negatively related to egocentric interference as measured by performance on the most difficult trials of Level-2 VPT (Other, Inconsistent). These results are discussed in relation to recent findings suggesting that different measures of theory-of-mind abilities reflect the activity of independent cognitive systems.

Poster Presentation

French schwa reduction in low-proficiency second language listeners: Learning and generalization overnight

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In casual speech, native speakers speak faster, reduce words, and enunciate less well than in formal contexts, which makes it difficult for non-natives to understand them. For example, learners of French have less problem understanding ministre when it is pronounced in full than when it is reduced to [miz]. We investigated whether late learners' difficulties in comprehending the casual variants of words could be explained simply by the lack of exposure to these variants in a classroom environment. Additionally, we wanted to test whether, given successful recognition of both reduced and full forms of newly learnt words, learners can develop a pattern about reduction and apply it to previously known words. For instance, if learners of English are familiarized with the variations /ˈambjələns/-/ˈambjləns/ for ambulance and /ˈabsəlut/-/ˈabslut/ for absolute, can they then also easily understand /ˈkaθlɪk/ for catholic? To answer these questions, we tested 32 Dutch low-proficiency learners of French on French schwa reduction (e.g. pelouse, 'lawn', can be pronounced with a schwa [pəluz] or without [pluz]). On two consecutive days, we trained our participants on 24 unknown schwa words by exposing them equally often to the reduced and full forms of these words. We then measured our participants' accuracy and reaction times to these words as well as to previously encountered schwa words in both their full and reduced forms in an auditory lexical decision task. Our results show that the participants recognized both variants of the trained words almost equally well with a slight remaining advantage for the full form. However, no generalization of the schwa alternation pattern to previously known words was found despite our participants having had a night of sleep which has been shown to improve generalization. Our participants have thus stored both the full and reduced forms and not created a schwa alternation pattern.

Poster Presentation   **Session A**

The Eye Movement Measure of Memory and its Relationship with Explicit Measures

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The influences of past experience, either voluntary or involuntary, can be measured in many ways. Verbal reports and introspective judgments, which depend on the ability to understand specific instructions, articulate answers or follow response mapping rules, are the most widely used measures. Can behaviors as simple and automatic as where and what we look at, also reflect the influences of our past experience? This study examined whether the eye movement can be used to measure memory of past events and its relationship with the explicit measures. Contrary to previous studies using an all-or-none measure of conscious memory, such as recognition, the present study asked participants to place a wager based on their confidence that the target had been presented. In Experiment 1, after studying a list of Chinese characters, the participants received a recognition memory test. For each trial the participants had to indicate, among one studied character and two nonstudied homonyms, which character they had studied. Participants' eye movements were monitored while they viewed the three-character test display. Both the time-course and response-locked measures showed that participants viewed the studied character longer than the nonstudied character regardless of their explicit response. Experiment 2 used a wagering task to assess participants' conscious awareness and found that wagering points predicted viewing time for the target better than the recognition accuracy did. The present study was the first using verbal materials to replicate previous findings of the effectiveness of eye movements to reveal the influence of past experiences. These findings show that eye movements, which require neither special instructions with complex rules of response mapping nor explicit reports, are alternative measures of memory. In addition, explicit measures of memory were weakly associated with the viewing time measure and the association was stronger when the implicit and explicit measures were compatible.

Poster Presentation

Session A

Refreshing and semantic elaboration: The same or different mechanisms?

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Attentional refreshing (or simply, refreshing) is a recently proposed attention-based mechanism that serves the function of briefly maintaining information by prolonging its activation in working memory. Although refreshing has been linked to performance advantages in working memory and long-term episodic memory, it is still not well understood whether refreshing is distinguishable from other forms of maintenance known to yield similar performance advantages, such as semantic elaboration. The following study examined whether refreshing is distinguishable from semantic elaboration by using a variant of the original refreshing paradigm advanced by Johnson and colleagues. Participants studied five successively presented words (e.g., DOG), each followed by either a cue to repeat the word (view DOG and repeat "dog" again); refresh the word (view * and respond "dog"); repeat and elaborate on the word (view DOG, repeat "dog" again, and compare its relative size to a soccer ball); refresh and elaborate on the word (view *, respond "dog", and compare its relative size to a soccer ball); or simply read the word once (followed by a blank screen of equivalent duration). At the end of the trial, participants attempted forward-ordered serial recall by selecting the list items from a pool of 10 words. After each block of five trials (five blocks total), participants also freely recalled the words from episodic memory. Whereas we observed no benefit of refreshing for recall in either the working memory or episodic memory tests, semantic elaboration improved performance in both tests, replicating recent research showing a levels-of-processing effect in working memory and episodic memory. These results suggest that the advantage of refreshing to working memory and episodic memory demonstrated in previous studies is less relevant than and perhaps over-shadowed by other well-documented forms of maintenance, such as semantic elaboration. We conclude that refreshing is distinguishable from semantic elaboration.

Poster Presentation   **Session A**

Semantic congruency improves recognition memory performance for not only audiovisual but also unisensory stimuli

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In recent years, the benefit of multisensory memory encoding has been under interest. Memory research has shown that audiovisual semantic congruency during encoding facilitates later unisensory recognition memory performance with nonverbal and verbal material. However, it is still unclear whether this improvement is due to multisensory semantic congruency or just semantic congruency per se. In the present study, we investigated whether unisensory (dual visual or dual auditory) memory encoding facilitates unisensory recognition memory performance in a same way as audiovisual encoding. The participants memorized auditory or visual stimuli (sounds, pictures, spoken words or written words), each of which were presented together with a semantically congruent, incongruent or non-semantic stimulus in the same modality or in the opposing modality during encoding. The encoding phase was followed by a unisensory recognition memory task, where the memorized stimuli were presented again with an equal number of new stimuli, and the participants made a new/old judgment of each stimulus. Recognition memory performance was better when the stimulus was initially presented with a semantically congruent stimulus than when it was presented with a non-semantic stimulus. This congruency effect was observed with audiovisual stimuli (spoken words presented with pictures) and dual visual stimuli (written words presented with pictures, and pictures presented with pictures). However, dual auditory stimuli (sounds presented with congruent spoken words) did not elicit a congruency effect, neither did pictures presented with congruent written words during encoding. Our results show that not only multisensory but also unisensory semantically congruent stimuli can facilitate memory encoding and improve later memory performance. Thus, the semantic congruency effect is not solely multisensory, as previously suggested.

Poster Presentation
Session A

Hemispheric differences in implicit probabilistic sequence learning: brain stimulation over the left vs. right DLPFC modulates consolidation of sequential memories in interaction with sleep

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Sequence learning is crucial in everyday life from childhood to old age; it underlies the acquisition of motor, cognitive, as well as social skills. Previous studies have shown the involvement of the fronto-striatal circuits in this type of learning. The specific functions of the components of these circuits are, however, still debated. The aim of the present study was to directly investigate the causal role of the right and left PFC in implicit/incidental sequence learning and its consolidation. Healthy young adults participated in the experiment. Anodal transcranial direct current stimulation (tDCS) over the right or left dorsolateral PFC (DLPFC) was applied during a probabilistic sequence learning task in order to enhance neural excitability of the targeted brain areas. Learning performance was tested during stimulation and 12 hours later. In order to investigate how brain stimulation during learning affects sleep-dependent memory consolidation, we compared experimental groups who did or did not have sleep in the 12-hour consolidation period (AM-PM vs. PM-AM design). Here we show no sleep effect on consolidation of implicit sequential memories in the placebo/control group, however, the interaction between sleep/no sleep conditions and tDCS on right vs. left DLPFC was significant. Our results can lead to a deeper understanding of the relationship between sleep and memory consolidation and the role of the PFC in these processes.

Poster Presentation

One-year retention of implicit sequential memory: Evidence from a probabilistic sequence learning task

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Probabilistic sequence learning (PSL) underlies the efficient processing of statistical patterns in our environment and it is therefore crucial in many day-to-day activities. PSL is acquired gradually; however, only limited information is available about its long-term retention. Previous studies emphasized the role of frontostriatal circuits in PSL. The aim of the present study was to investigate the plasticity of these circuits involved in short- and long-term retention of PSL. Healthy young adults (N = 46) performed the Alternating Serial Reaction Time (ASRT) task, which separately measures the sequence-specific and general skill learning component of PSL. Three sessions were administered in the experiment: a learning phase, 24-hour and one-year retention phases. We found evidence for retained PSL after 24-hour delay. Moreover, results showed retention of sequence-specific knowledge even after the one-year period, indicated by similar performance during the second and third sessions. In contrast, general skills decreased after one year. The degree of sequence-specific retention for one year was not associated with the frontal-lobe mediated working memory and executive functions suggesting the independence of automatic and controlled adaptive processes. In sum, these results highlight the long-term persistence of the frontostriatal circuits mediated sequential memories even without further practice.

Poster Presentation

Reducing memory distortions level by means of encoding strategy in the DRM paradigm

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Two experiments were conducted to investigate how different encoding strategies affect memory of semantically related words using the DRM paradigm. Five encoding strategies were compared: imaginative, whispering, saying aloud, engaging and control. In Experiment 1, the recognition test revealed that veridical memory appeared to be better when words were read aloud or when no encoding strategy was applied. False alarms rate was the lowest in two latter conditions and in imaginative condition. In contrast, in recall, better veridical memory in saying word aloud and in imaginative conditions was with the costs of high rate of false memories. In Experiment 2, we tested whether under inclusion instruction participants generated similar number of word in each strategy. The results let us conclude that source monitoring is responsible for memory performance and following different strategies its effectiveness is different.

Poster Presentation

Bridging familiarity-based recognition memory and novelty detection: A matter of timing

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Detecting novelty is essential to adapt to environmental changes. Memory plays an important role in novelty detection since the latter relies on the capacity to discriminate what is already known from what is new. However, the computational mechanism underlying this process remains hypothetical. A first hypothesis posits that novelty detection mirrors familiarity-based recognition memory. Thus, novelty signals would be triggered by the absence of familiarity. According to another hypothesis, novelty signals stem from a conflict in the comparison between expectations retrieved from memory and sensory input. These two views make different predictions regarding both processes' temporal dynamics. Whilst the first hypothesis suggests that novelty detection and familiarity occur at the same speed, the second hypothesis suggests that novelty detection is slower than familiarity, since stored patterns have to be retrieved to generate predictions. To test these hypotheses, we measured the fastest speed of novelty detection and familiarity in 20 young adults. We adapted a recent speeded recognition memory task and created two conditions: a familiarity and a novelty detection condition. We compared recognition accuracy and minimal reaction times between conditions. The results showed significantly better performance, shorter minimal reaction time and a more conservative bias for familiarity than novelty detection. A positive correlation was found between performance in both conditions and negative correlations were shown between biases as well as between performance and minimal reaction times in each of the conditions. Based on these correlations, we argue in favor of a unique familiarity/novelty discrimination system, with familiarity and novelty detection at the two ends of a same continuum. According to signal detection theory, this suggests a same old/new decision criterion although biased towards familiarity ('old' judgments). We explain the differences between conditions by a more liberal response bias for novelty detection and thus a higher number of false alarms.

Poster Presentation   **Session A**

The development of a learning phase of basic actions required during interactions in a new virtual environment

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Over the last few years, there is a growing body of research that use virtual reality to assess cognitive functions. This technology encompasses a wide variety of devices (Joystick, Kinect, etc.) that require a specific learning. However, there is a lack of information in the literature about how patients become familiar with these devices. This learning phase is mostly based on a subjective feeling of confidence with the device and potentially leads to a multi-tasking situation in which patients have to realize cognitive test while keeping in mind actions required for interactions with the virtual environment. In this context, our aim was to highlight, through case studies, the difficulties encountered by patients in the learning phase of the basic actions required for interactions in our new virtual environment, Realistic Observations in Game and Experience in Rehabilitation (R.O.G.E.R). It is a prototype of a virtual environment where brain damages patients can move freely in a house and shift objects from one place to another thanks to a Nunchuk. Some of the difficulties encountered by patients can be explained by a multiplicity of executive functions involved in learning. Another possible reason for this failure could be the high memory load needed to integrate the rules of navigation in this environment. Based on these case studies, we proposed to develop a standardized learning phase of basic actions required during interactions in a simplistic virtual environment free of any interference. The learning phase is based now upon the principle of errorless learning. In this context, the learning phase consists in carrying out task-relevant actions in a progressive and error-limiting manner.

Poster Presentation

Self-awareness in cognitive ageing

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Human's awareness of their own cognitive abilities is known as metacognition (Flavell, 1979). Previous ageing studies (Souchay et al., 2007) have revealed older adults ability to predict their performance on some memory tasks, such as in semantic memory, but not in others (Froger et al., 2011). As the majority of metacognitive studies have focused on memory, the present research will expand these findings in more cognitive areas, by investigating whether young and older adults are aware of their cognitive skills, the effect of ageing on metacognition, as well as whether awareness remains stable across different cognitive domains. This study includes tasks from different cognitive areas, such as short-term and working memory, semantic memory, abstract and real life problem solving, which are used in neuropsychological assessment. The research questions concern whether participants' metacognitive beliefs are accurate, and whether metacognition changes across different domains. Methods: A group of young and older adults completed questionnaires for evaluating their own skills in the above-mentioned domains, and performed a task for each cognitive area. Results: Young adults' self-awareness was significantly different with their performance in short-term memory and real life problem solving, showing their inability to predict their performance. Older adults' performance in semantic and short-term memory, as well as in real life problem solving was significantly different with their self-evaluation, revealing that their metacognitive beliefs in these cognitive domains are not accurate. Concluding, the findings from the present research indicated young adults' ability to predict their skills in semantic and working memory, as well as in abstract problem solving. Older adults' metacognitive beliefs were found to be accurate in working memory and abstract problem solving. Both groups' metacognitive beliefs changed across the different cognitive domains, supporting that metacognition is not a unitary function, but is subjective to the cognitive domain that is tested.

Poster Presentation

Neuropsychological profiles in elderly patient groups classified according to main icd-10 blocks

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The aim was to look for pattern of common results within each diagnostic group.

Number of patients included in the preliminary analysis is N=133, which only allow for main block categorization within the ICD-10 system(F00-F09,F20-F29,F30-F39 and F40-F48) .The patients were tested with the following neuropsychological tests: Verbal fluency (FAS), Stroop A/B, Stroop C, TMT A/B, ROCF,Digit span,CVLT,Clock test, MMSE, MoCa, MADRS. The (F00-F09) patients performed significantly worse than the average patients on most tests, including the Stroop,TMT,ROCF,CVLT delayed tests,MMSE, MoCA,Clock- drawing-test. The(F20-F29)performed significantly poorer than the patient average on the digit span test. No other tests showed significantly poorer or better results than the average patients. The(F40-F48) performed significantly poorer than the average patients on the TMT-A test. They performed significantly better than the other patients on the Digit span test. The depression patents (F30-F39) performed significantly better than average patients on the screening testes (MMSE and MOCA), and as expected they scored significantly higher on the MADRS depression scale. The analysis also shows that age was a significant co-variable on the MoCa test, but not on the MMSE test, indicating that the MoCa test is more sensitive to age differences than the MMSE test. The patients classified as having an organic brain disease (F00-F09) were as expected poorer on most tests than all other diagnostic groups. Anxiety patients and depression patients generally perform better than the non-mood psychotic disorders (F20-F29) on the Digit span test, while the non-psychotic mental disorder patients (F40-F48) performed significantly poorer than the non-mood psychotic patients on the TMT/A test. We learn more about our patient groups, in that combination of test results may point to patterns of which are most common for particular diagnostic groups. However, it is not possible to conclude on a diagnosis for a single patient from neuropsychological tests

Poster Presentation

Is age really cruel to experts – compensatory effects of practice

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The aim of the study was to examine age-related skill functions in the case of chess expertise, in particular, 'age is kinder to the initially more able' hypothesis. Previous studies provide inconclusive results, showing that experts with higher rating scores, initially more able, have lesser decline over age compared with non-experts, or contrary, that declining rates of experts and non-experts do not differ. These studies suffered from methodological problems, such as lack of practice records for players, inappropriate functions to describe skill trajectories and range restriction of ability measures. In this study, we investigated the 'age is kinder to the initially more able' hypothesis by using chess databases that contains activity records for both beginners and word-class players. We applied linear-mixed effect models to estimate the age-related trajectories of more and less able players. The leave one out cross-validation indicated that the best fit is provided by a cubic function, which captures three phases of skill behavior as described in Simonton's (1997) model of career trajectories: initial rise to the peak of performance, post-peak decline, and stabilization of decline. The more able players reached a higher peak than their less able peers, but also deteriorated more quickly. After the post-peak decline, the declining rate starts to stabilize, and the point of stabilization starts earlier for the experts than for the non-expert players. The decline and its stabilization were significantly influenced by practice. The more players engaged in playing tournaments games, the less they declined and earlier they started to stabilize. Our study shows that age may be kind to more able in subtler manner than previously assumed. The experts may not be immune to aging, but previously acquired knowledge and current practice enables them to maintain high levels of skill at an advanced age.
Keywords: aging, expertise, linear mixed-effect, chess

Poster Presentation   **Session A**

Evolution of visual expertise for print through aging: an N170 component study

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Visual processing efficiency decreases with aging (Bieniek et al., 2013). Deficits have been observed in the processing of basic visual stimuli as well as more complex stimuli such as faces. A way to explore the visual processing is to investigate the N170 component. This component reflects early neural processing of visual stimuli and has been interpreted as a marker of visual expertise for a given stimulus. Numerous studies indicated a greater amplitude of the N170 component for familiar stimuli (faces, words) compared to nonfamiliar ones (objects, symbols) (Bentin et al., 1996; Bentin et al., 1999). This visual expertise for faces remained intact for elderly (Gao et al., 2009; Daniel et al., 2012), but was delayed compared to younger people (Rousselet et al., 2009; Daniel et al., 2012; Bieniek et al., 2013). The objective of the present study was to further explore visual expertise for printed stimuli, and to investigate if the delayed but efficient processing of faces in elderly was also found for printed stimuli.. Four different age groups participated in the study (20-30years; 40-50years, 60-70years; 75+ years). Event-related potentials were recorded in a lexical decision task, in which words and symbol strings were presented. Analyses of the N170 mean amplitude indicated larger amplitude for words than for symbol strings, and no interaction between stimuli and age was observed. Visual expertise for words was preserved with aging. However, analyses of the N170 peak latency revealed an interaction between stimuli and age. The N170 peak was earlier for symbols than for words only for the younger group, whereas the N170 was earlier for words than word symbols for both elderly groups.

Poster Presentation

Concept typicality responses in the semantic network and along aging

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Concept typicality is a key dimension of semantic memory that reflects the degree to which a concept (lion, whale) belongs to a given category (mammal). For decades, typicality has been recognized as critical to structuring conceptual knowledge, and more recently, it has helped identify the semantic neural network. To better understand the regions sensitive to concept typicality and how this conceptual dimension changes along aging, we conducted behavioural and fMRI studies in healthy young and old adults. Study 1 consisted on an fMRI category verification task with young adults, in which concept typicality was manipulated. Categorizing atypical items involved greater activation in bilateral anterior temporal lobes (ATL) and left inferior frontal gyrus, revealing a synergy between conceptual representation and executive control. In contrast, categorization of typical items recruited the inferior parietal lobe (IPL) and posterior temporal regions. Thus, while ATL responded to the idiosyncratic feature structures of atypical concepts, IPL was sensitive to feature similarity and coherence. Study 2 comprised the same behavioural task with older adults. Participants were divided into two groups according to their performance in MoCA. Old adults above MoCA's cut-off showed higher accuracy for atypical items relative to young participants and old adults below cut-off. This indicates an increase of knowledge on atypical items from young to older ages in the healthy population. However, cognitive decline, as indexed by below cut-off scores in MoCA, was linked to lower performance specifically for atypical items, suggesting vulnerability of the semantic system. Overall, exploring concept typicality provides a wide angle on how the semantic system is organized and affected by aging. The results help to disentangle the role of ATL and IPL as amodal semantic hubs and have implications for understanding the nature of the semantic deficits in age-related cognitive decline.

Poster Presentation

Exploring the relationships between cognitive reserve, memory and cognitive performance as a function of age in healthy adults

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The main objective of this research is to investigate the predictive relationship between a two-factor model of cognitive reserve (CR) and memory/global cognition outcomes. CR, the brain's capacity to cope with pathology in order to minimise symptomatology, has been linked with differential susceptibility to age-related memory changes and dementia. The two-factor model of CR proposed in this study was derived from factor analysis and is comprised of Executive Function/Processing Resources (EF/PR) and Cognitive Activity (CA). The main objective of this research was to develop a structural model of CR to investigate the relationship between baseline CR and level of cognitive functioning at 12-year follow-up in a longitudinal ageing study dataset . The impact of age on structure and fit of the model was investigated. Analysis was conducted on data from the Maastricht Ageing Study (MAAS), a 12-year follow-up study on cognitive ageing (n=1587). The predictive validity of the CR model was investigated using measures of cognitive function and cognitive activity contained in this large dataset of risk factors and cognitive decline/dementia outcomes. Structural equation modelling (WLSMV estimation) was used to investigate relationships between CR capacity, memory and global cognition in three age groups – 24-49 years, 50-64 years, and 65-82 years. Results indicate that overall the model fits the data reasonably well for the youngest age group (24-49 years) and fit improves incrementally as age increases. Baseline EF/PR was a strong predictor of memory/global cognition scores at 12-year follow-up across all age groups but baseline CA was not a significant predictor. Investigating the predictive validity of the CR model has helped elucidate the underlying structure of and the relationship among the hypothesized constructs.

Poster Presentation

On-line social networking and cognitive performance in older adults: A Greek-Canadian cross-cultural study

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The present study examined differences in cognitive performance and social networking (off-line and on-line), as well as the relationship between the two types of measures, in older adults from two culturally diverse populations: Canadians and Greeks. The two groups were matched in terms of age, gender, education level and MMSE scores. Participants were asked to report on the support they received through their online and offline social interactions in the context of two relevant questionnaires. They were also given immediate and delayed recall tasks, as well as measures of speed of processing and executive functioning (Trail Making, parts A and B). Canadian participants reported receiving a greater amount of on-line social contact and support and they performed significantly faster in both the processing speed and the executive functioning tasks; there were no differences in the off-line support and the recall measures. On-line networking was significantly associated with processing speed and executive functioning, with culture not moderating the observed relationships. The findings are discussed in relation to the characteristics of the specific cultural contexts, stressing the need to further explore the effects of online social networking and engagement on cognitive function in the silver years.

Poster Presentation   **Session A**

The nature of statistical learning (SL) deficits among adults with Developmental Dyslexia (DD) : A-modal or modality specific?

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It has been recently suggested that individuals with DD are deficient in SL. However, the nature of this deficit is still unclear. The aim of the current study was to explore whether SL deficits are a-modal or modality specific using a classic AGL task. Sixty three adults participated in two experiments, 31 in the DD group, and 32 in the controls. The stimuli for the visual task were letter sequences, and the stimuli for the auditory task were tone strings. The strings in the auditory task were identical to the visual strings, and were created by mapping each letter to a tone. Results showed that all participants exceeded chance level in both modalities. However, a significant difference was found between DD and controls in both modalities, supporting the SL learning deficit hypothesis for individuals with DD. In addition, a significant interaction showed that a significant difference between the modalities was found only for DD and not for control group. These results suggest that while controls' SL skills are a-modal in nature, for the DD participants SL skills are constrained by the modality in which stimulus is presented. Theoretical and clinical implications are discussed.

Poster Presentation

A predictive test battery of early literacy abilities for five-year-old prereaders

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Phonological abilities like phonological awareness, verbal short-term memory and rapid automatized naming have been shown to be reliable predictors of early literacy acquisition abilities (Landerl & al., 2013). Letter knowledge (Foulin, 2005) and short-term memory for order information (Martinez Perez & al., 2012) have also been associated with reading acquisition. In order to identify children at risk for reading acquisition difficulties at a very early stage, we designed a battery of tests ("Batterie d'evaluation collective des Prerequis specifiques a l'apprentissage du Langage Ecrit en 3eme maternelle", BPLE,) which permits a collective assessment of the different predictors identified to support literacy acquisition. The aim of the present study was to validate this battery by assessing, for children in 3rd year kindergarten, its ability to predict reading and writing abilities one year later (first year of elementary school). A total of 88 5-year-old kindergartners were administered the BPLE. Their reading and written language abilities were measured 1 year later. Regression analyses showed that each subtest of the battery predicted performance in the writing tasks one year later. Phonological awareness, short-term memory and rapid automatized naming were all independent predictors. All the abilities assessed by the battery were also predictors of reading performance one year later. Phonological awareness and rapid automatized naming were independent predictors. These results show that this battery is a valid tool for predicting, in 3rd year kindergarten children, literacy abilities one year later. The BPLE appears thus to be a promising tool for detecting, at an early stage, children at risk for later literacy acquisition difficulties.

Poster Presentation

Localizing the effect of anodal transcranial direct current stimulation (tDCS): evidence from an integrated system of Transcranial Magnetic Stimulation and Electroencephalography (TMS-EEG)

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Despite transcranial direct current stimulation (tDCS) is increasingly used for clinical and research purposes, the neurophysiological underpinnings of its immediate and delayed effects, and to what extent the stimulation of a given cerebral region may affect the activity of anatomically connected regions, still remain unclear. In the present study, we used an integrated system of Transcranial Magnetic Stimulation and Electroencephalography (TMS-EEG) to explore local and global cortical excitability modulation during and after active and sham tDCS. Single pulse TMS was delivered over the left posterior parietal cortex (PPC), before, during, and after 15 min of anodal tDCS over the right PPC. EEG was concurrently recorded from 60 channels. For each session, indexes of global and local cerebral excitability were obtained, computed as global and local mean field power (Global Mean Field Power, GMFP and Local Mean Field Power, LMFP) on mean TMS-evoked potentials (TEPs). The global index was computed on all 60 channels. The local indexes were computed in six clusters of electrodes: left and right in frontal, parietal and temporal regions. a source modeling analysis was also performed, computing global and local current density at the cortical level in order to better define the localization of the induced tDCS effects, avoiding the potential confound of volume conduction.

Results, both at the sensors and source level, showed an increase of GMFP, compared to baseline, both during and after active tDCS. LMFP and local current density increased after the end of stimulation in parietal and frontal clusters, while no difference was found in the temporal ones. The results suggest that anodal tDCS induces a widespread rise of cortical excitability, both during and after the end of the stimulation. These results have clear implications for the use of tDCS in both clinical and experimental settings.

Poster Presentation   **Session A**

Counter-intuitive error latency distributions predicted by drift-diffusion model

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Speed accuracy trade-offs are classically described by decision models as shifts in response thresholds; emphasising speed over accuracy leads to lowers response thresholds and produces faster, but more inaccurate, performance. Intuitively, it could be expected that increased errors during speed emphasis will be located at the fast end of the latency distribution at the latencies that are less common when accuracy is emphasised, while for slower reaction times we might expect the rates to be similar under speed and accuracy emphasis. Indeed, this pattern seems to be observed in the flanker task (Wylie et al., 2009). However, after simulating the speed-accuracy trade-off by adjusting threshold differences in the drift-diffusion model (Ratcliff, 1978), we found that the percentage of errors in speed trials was predicted to be greater across the whole latency distribution compared to accuracy trials. We tested this prediction by running participants on a manual version of the Stroop task under different speed-accuracy conditions (Experiment 1). Consistent with the predictions of the drift-diffusion model, the percentage of errors under speed emphasis remained higher than under neutral or accuracy emphasis across the whole reaction time distribution. We confirmed this finding in Experiment 2 where we used a different method of manipulating speed/accuracy trade-off - a gradual change in emphasis from speed to accuracy and vice versa. These results show that the drift-diffusion model is able to accurately capture counter-intuitive error latency distributions in the Stroop task but not the more intuitive pattern found in the Flanker task. This discrepancy between two response-inhibition tasks suggests that our current understanding of speed/accuracy trade-offs may be incomplete.

Poster Presentation

Virtual Morality: Moral Action As Distinct From Moral Judgement

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The relationship between moral judgement and moral action has been deliberated in multidisciplinary contexts. Dual-process models have attempted to interpret differing responses to moral judgements in light of cognitive versus emotional systems and action, outcome, and value assignment. Little research has attempted to understand moral actions in this sense; are they associated or distinct from moral judgements? We introduce Virtual Reality (VR) moral paradigms in order to examine the actions individuals endorse in high emotionally arousing moral scenarios requiring direct action. We found a greater endorsement of utilitarian responses – killing one in order to save many others - in moral virtual dilemmas requiring action compared to hypothetical counterparts requiring judgement. Importantly, we assessed pro-social and anti-social personality traits given that moral hypocrisy, the disparity between moral judgement and action, appears prevalent in individuals with psychopathic traits. We found that psychopathic traits predicted utilitarian responses for virtual actions but not for hypothetical judgements. Furthermore, a collection of anti-social variables - termed 'Callousness' - predicted virtual actions only. Our research would suggest that moral judgement can be viewed as an independent construct to moral action; offering new views for investigating and assessing moral behaviour.

Poster Presentation

Eyetracking as indirect method of deception detection

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The goal of the present study was to test whether using indirect method of deception detection results in different behaviour of the observers than the direct method. To answer this question, eye movements were monitored during deception detection. Sixty participants watched statements of six different people describing most stressful autobiographical experience. Half of the senders were lying. Depending on study condition the observers were asked either to directly assess the truthfulness of the senders or to assess if the senders were thinking hard. During the assessment number of observers' fixations and the duration of fixations were monitored for four areas of senders' body separately: upper part of face (nose, eyes, and forehead), lower part of face (lips, chin), torso and hands as well as legs. Unexpectedly, the results revealed that the indirect method of deception detection did not exceed the direct one in the accuracy of distinguishing between truthful and deceptive statements. However, the eye tracking monitoring showed that the mean duration of a single fixation, the processing duration as well as fixation frequency were greater for upper and lower art of face than for torso and legs. The duration of a single fixation and the processing time were longer for lying senders; however only in the indirect condition. The theoretical and practical implications of these findings are discussed.

Poster Presentation   **Session A**

Saccade countermanding reflects automatic inhibition as well as top-down cognitive control

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Saccade countermanding is commonly employed for investigating cognitive control, as typically modelled by competing go and (top-down) stop processes. However, saccade initiation can also be interrupted automatically by lateral inhibition in motor programming maps or circuits. Such automatic interruption can cause dips in saccade latency distributions (known as 'saccadic inhibition') where a portion of saccade plans are disrupted after a specific delay following a distracting visual stimulus. This low level effect may account for a large proportion of the saccade countermanding process and the measured stop signal reaction time (SSRT) when visual signals are used. Potentially this could also explain why saccade SSRT is typically faster with a visual stop signal than an auditory signal. To investigate whether the saccadic inhibition effect is an important component of saccade countermanding we directly compared the latency distributions of failed inhibitions during a saccade countermanding task to equivalent latency distributions containing distractor-induced dips where participants were asked to ignore the stop signal. Distractor induced dips in both contexts were timelocked to the onset of the visual signal and began ~100ms following signal onset (a little later than expected) and peaked at ~150ms post-signal onset. In the stop context, the countermanding effect can be accounted for by saccadic inhibition between 150 and 200ms after signal onset (where no saccades occur in latency distribution). Biologically-inspired models of transient automatic and sustained endogenous signals are able to capture these distributions and their findings will be discussed. It is proposed that top-down inhibition acts later in the distribution where a post-dip recovery period observed in the ignore context is substantially suppressed in latency distributions of the stop context. SSRTs calculated from these experiments are largely capturing the automatic, stimulus-driven effects rather than the temporal dynamics of cognitive control and how these differ between populations and conditions.

Poster Presentation   **Session A**

Perceptual determinants of trust in work relations

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Two experimental studies were designed to recognize the influence of perceived competence and warmth on interpersonal trust at work. We predict that in case of trust, the general primacy of warmth over competence can be reversed in certain circumstances created by business and organizational context. In Study 1, 273 corporate workers read the story about a colleague or a supervisor presenting competent (high vs. low) and warm (high vs. low) behaviors. Subsequently, perceived trustworthiness was measured. Data revealed that perceived competence impacts trust in a supervisor and a colleague, whereas perceived warmth impacts trust in a supervisor. In Study 2, 173 managers read the story about a subordinate or a colleague and assessed trustworthiness. Results indicate that managers trust in subordinates and colleagues whom they perceive as competent. Our findings provide the first evidence that perceived competence influences trust in the workplace regardless of the position of the trustee, whereas warmth is important only in establishing trust in people holding higher positions within the organizational hierarchy.

Poster Presentation

Personal identity and emotional expressions as clues for cooperative tendencies

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Choices about the likely behavior of other people during interpersonal interactions can be based on different types of information. Two of the most relevant of these sources are the behavioral tendencies associated to specific personal identities and their facial emotional displays. The present electrophysiological experiment aimed to study stages of processing associated to the use of these cues and their temporal dynamics. Participants played a trust game with 8 different alleged partners, and in different blocks either the identity or the emotions carried information regarding the partner's proximate cooperation behavior. Behavioral responses showed that whereas cooperation rates were equal across blocks, participants were faster when they used the identity compared to the emotional expression of the partners. We also observed that in blocks where emotions were irrelevant, they still influenced the speed of choices depending on the congruency between the identity and the emotion displayed. Electrophysiological results showed early differences between cooperative and non-cooperative partners depending on the clue (identity or emotion) carrying this information, as reflected on the centro-medial N100 and Vertex Positive Potential. On the other hand, non-cooperative partners enhanced the N200, a potential that has been linked to conflict detection, and diminished the amplitude of the P300, but only when the clue for cooperation was the personal identity. In addition, the interference effect generated by the emotions ignored during the identity block was reflected on the N170 amplitude, as an expression of anger enhanced the amplitude of this potential but only for cooperative partners. Overall, our results suggest that using the identity or the emotion displayed by a face to predict cooperation tendencies recruits dissociable neural circuits from an early point in time.

Poster Presentation

On the neurocognitive origins of human tool use : a critical review of neuroimaging data

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Tool use is considered by many to be a hallmark of complex cognitive adaptations. So, understanding its neurocognitive bases can provide fundamental insights into the evolution of human lineage. Since more than a century, neuropsychological models have assumed that the left inferior parietal cortex is central to tool use by storing manipulation knowledge (manipulation-based approach). This approach is highly inspired by continuity theories of the evolution of human cognition, by formulating that manipulation knowledge is of the same kind as the motor schemas useful for non-tool-use actions (grasping, transport), also present in nonhuman primates. Interestingly, recent neuropsychological evidence indicates that the left inferior parietal cortex might rather support the ability to reason about physical object properties (reasoning-based approach). This second approach is akin to discontinuity theories by suggesting that this reasoning is unique to humans. Historically, these two approaches have been developed from data obtained in left brain-damaged patients. This work will (1) give an overview of the two aforementioned approaches and (2) reanalyze functional neuroimaging data of the past decade to examine their predictions. Globally, we demonstrate that the left inferior parietal cortex is involved in the understanding of tool-use actions, providing support for the reasoning-based approach and, therefore, discontinuity theories. We also discuss the functional involvement of the different regions of the tooluse brain network (left inferior frontal cortex, left posterior temporal cortex, bilateral superior parietal cortex). Our findings open promising avenues for future research on the neurocognitive basis of human tool use.

Poster Presentation

Increasing cognitive confidence in a sub-clinical checking population

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Previous research on compulsive checking shows that checkers have impaired prospective memory as well as reduced cognitive confidence and vividness in their actions. As a result individuals with checking tendencies feel uncertain whether an action has been completed which urge them to engage in checking behaviours. Therefore, the study's primary objective is to increase cognitive confidence and vividness by using two interventions: implementation intentions and mental imagery. Implementation intentions are action plans based on an 'if-then' format and have been repeatedly found to enhance goal achievement by bridging the intentionbehaviour gap.

This is a quasi-experimental between subjects study with 120 non-clinical participants. The independent variables were the condition group and participants' checking score. The dependent variables were the prospective memory performance, confidence and vividness scores.

Participants were classified as high or low checkers based on their checking score. Half of the high/low checkers were instructed to use the two strategies prior to the task (intervention condition). All participants performed a computerised prospective memory task. They were engaged in an on-going memory task and had to remember to press a different key when a specific cue occurred. At the end of the task participants were asked to provide confidence and vividness ratings about their performance.

Analyses revealed that individuals in the intervention condition reported increased confidence in their actions. Also, their memory of performing the action was more vivid compared to controls. Interestingly, no difference was found in prospective memory, possibly due to the nature of the task.

The study proposes that implementation intentions with imagery increases cognitive confidence and vividness by forming strong associations between the cue and the action.. The findings suggest that the intervention could possibly reduce checking repetitions within a clinical population.

Poster Presentation

Comparison of individuals' susceptibility to false memory induced by both DRM and misinformation paradigms involving emotional material

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False memories induced by the DRM procedure ("Deese, Roediger and McDermott"; Deese, 1959; Roediger & McDermott, 1995) or the misinformation procedure (in which a person's recollection of a witnessed event is altered after exposure to misinformation about this event; Loftus et al., 1978) are due to errors in source monitoring processes (e.g., Johnson et al., 1993) and one might expect the correlation between these false memories quite positive. However, the few laboratory studies comparing the DRM paradigm and the misinformation paradigm show small (Zhu et al., 2013) or no correlation (Ost et al., 2013) between the false memories elicited by these procedures. However, these studies vary in terms of methodological details. For instance, false memories from the misinformation procedure involved emotional content while those from the DRM procedure only included neutral materials. This study investigated the relationship between false memories induced by two different paradigms (a DRM task and a misinformation procedure) both involving an emotional material. Participants (N = 154) completed an emotional variant of the DRM (neutral, positive and negative lists) and the misinformation (neutral, positive and negative images) procedures and their performances on both tasks were compared. Although both paradigms reliably induced false memories in participants, our analyses revealed only a marginally weak positive correlation (r = .147, p = .051) between misinformation and DRM false memories using emotional variants. These results support the idea that DRM and misinformation false memories are underpinned by (at least in part) different mechanisms and that the previous mixed results were not due to the specific content of the DRM or the misinformation task used.

Poster Presentation

Relationships between depression, anxiety and stress levels, and Latvian words affective ratings

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The aim of the study was to investigate the relationships between depression, anxiety and stress level, and affective valences, arousal and frequency of Latvian words as well as stability of average scores of variables after 2 weeks. In the first stage of the study participants were 93 adults aged 18 to 50 years (28% men, 72% women, all students). After two weeks all measurements were repeated in sample with 38 students (age: 19-39, 29% of men, 71% women). Instruments used in the study: 1) Depression, anxiety and stress Scale (DASS-42, Lovibond, Lovibond, 1995; adapted in Latvian Vanags, Rascevska, 2015); 2) The list of Latvian words - a total of 28 nouns that contains positive, negative and neutral valence words (words selection was based on both evaluations of same English words valence in other study). At first each participant had to evaluate the affective valence of each word in 9-point scale (from +4 "very positive" and -4 "very negative"), arousal of the words (from 1 "calm" to 9 "intense") and in a scale of 1 to 9 were rated the usage frequency of words (from 1 "very rarely" to 9 "very often"). Initial results showed that depression, anxiety and stress indicators are statistically significant related to positive and negative words affective valence ratings. Individuals with higher level of depression, anxiety and stress rated higher (more negative) valences, arousal and usage frequency of the negative words. On the other hand, persons with higher level of depression, anxiety and stress are associated with lower (less positive) rate of affective valence and usage frequency of the positive words. Repeated measures after 2 weeks demonstrated statistically lower average level of depression, anxiety and stress indicators across the sample, but no differences were found on affective valences, arousal rates and usage frequency of the words.

Poster Presentation

Session A

Exploring shared and variant alterations in brain function between schizophrenia and bipolar disorder using resting-state fMRI

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Schizophrenia (SZ) and bipolar disorder (BP) are currently distinguished based on sets of specific symptoms, however they share considerable overlap in clinical features, genetic risk factors and co-occurrence among relatives. A common neurobiological substrate remains to be identified. The aim of the study was to investigate specific and common intrinsic network alterations in probands with SZ and BP.

30 healthy subjects (HC, age 38.1 }9), 25 patients with BP (type I, age 40.2 }11.1) and 16 patients with SZ (age 38.1 }8) underwent resting-state fMRI acquisition with eyes open. fMRI data was processed using the scripts from the 1000 Functional Connectomes Project. After a standard preprocessing and a regression model, we estimated single-subject functional connectivity with different statistical approaches aimed at elucidating different aspects of brain connectivity. We used double regression to identify the spatial extent of 20 intrinsic networks and seed-based resting-state functional connectivity (RSFC) to delineate the connectivity of the task-negative and task-positive networks. Anova and conjunction analyses were performed to identify common and specific alterations, ruling out the effects of age, gender, education and mean framewise displacement. Results were cluster-corrected for multiple comparisons with Montecarlo simulations. A significant cluster of reduced connectivity in precuneus within the posterior-DMN, was specific for BP patients. SZ patients showed specific increased connectivity in right putamen within the basal ganglia and reduced connectivity in right postcentral gyrus within the dorsal attentional network Shared alterations were identified as increased connectivity in cingulate cortex, within salience network and reduced connectivity in cingulum within the posterior-DMN, in right and left postcentral gyri in motor network and altered RSFC between medial prefrontal cortex and precuneus.

The abnormal network connectivity present in both groups of probands may reflect genetic vulnerability associated with risk for psychosis, while the alterations specific for each disorder may be associated with the distinct clinical progress.

Poster Presentation

The role of emotion understanding in children's developing skills at interpreting others' minds

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School-aged children's understanding of social-cognitive aspects of others' minds continues to develop beyond the middle school years. Discourse irony has recently been used as a revealing tool for studying the development of representing other people's minds in dyadic communication. In spite of the relative wealth of research on the development of irony understanding, research has generally failed to integrate emotion understanding within the framework of understanding the speaker's intended meaning. Yet, emotions are an integral aspect of any cognitive phenomenon (Oatley, 1992), and irony inherently evokes an appropriate configuration of emotions (Shelley, 2001). In the context of children's developing understanding of a speaker's mind, emotions involved in ironic communication may increase the cognitive salience of the discrepancy between what is said and what is meant. The aim of the present study was to investigate children's progressive understanding of different concepts underlying social reasoning in discourse irony and the effect of emotion understanding on advanced social-reasoning skills. Monolingual native-English 5-, 7-, and 9-year-olds participated in the study. They were administered a task consisting of four vignettes where a speaker made an ironic comment about the action of an addressee. We measured children's understanding of the socialcognitive aspects of the speaker's mind (i.e., meaning, belief, intention, and attitude) and their interpretation of the ironic speaker's actual (first-order emotions) and intended emotions (second-order emotions). Children were also assessed on tasks testing an advanced theory-of-mind understanding, their language competency, memory and their attunement to expressive prosody. There is a consistent pattern of relations, showing that age and understanding the ironic speaker's actual emotions as well as his/her intended emotions are significantly correlated with participants' reasoning about the ironist's mind. Children's AdvToM, linguistic and prosodic abilities were also correlated with their understanding of the speaker's mind.

Poster Presentation

Alzheimer's candidate gene, ABCA1 as a novel candidate gene for personality

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ABCA1 plays an important role in cholesterol homeostasis and high-density lipoprotein (HDL) metabolism. Results in the literature suggest that ABCA1 might be an important factor in Alzheimer's disease. For example ABCA1 knocked out mice would result in Alzheimer's disease symptoms. Also, certain personality traits (e.g. low conscientiousness, high neuroticism and low extraversion) have been indicated as risk factors for Alzheimer's disease.

Even though associations between ABCA1 and Alzheimer's disease have been demonstrated, which indicates possible associations between ABCA1 and characteristics of Alzheimer's disease (such as certain personality trait characteristics), according to our best knowledge, the possible association between ABCAI gene variants and personality traits has never been studied.

The present study aimed to analyze the possible genetic associations between temperament personality traits measured by Cloninger's Temperament and Character Inventory and genetic variants of the ABCA1 gene (rs1800977, rs4149264, rs2230805, rs2472384, rs2472386, rs2230808). The analyzed sample contained 305 Caucasian (Hungarian) young adults (43.6% males, 56.4% females; mean age: 21.5
demonstrated a nominally significant association between rs4149264 and harm avoidance (p=0.002). Also rs2472384, and rs2472386 showed an association with the temperament dimension of novelty seeking (p=0.039, p=0.004, respectively). After correcting for multiple testing, association between rs4149264 and harm avoidance remained significant. Results showed that the minor allele (C) is associated with lower harm avoidance mean scores (15.45
allele (16.68   } 4.1).

Results presented here might contribute to a better understanding of the genetic background of personality. However, further analysis is needed to clarify the associations between ABCA1 variants, personality and Alzheimer's disease, and further psychological characteristics of Alzheimer's disease, such as cognitive performance. This work was supported by the Hungarian Scientific Research Funds (OTKA K81466 and K100845) and the Active Psychology Foundation.

Poster Presentation　　　　　　　　　　　　　　**Session A**

Neural correlates of gender agreement violations containing emotional words: An event-related potential study

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The present study investigates the time course of the processing of emotional adjectives embedded in a sentence context using an agreement judgement task. Our main goal is to try to elucidate how syntactic information and emotional information interact in the course of building linguistic representations. In two previous experiments conducted in our lab (Diaz-Lago, Fraga, & Acuna-Farina, 2012; Padron, Diaz- Lago & Fraga, 2014), participants read sentences which contained noun-phrases with an adjective that mastched/mismatched the gender of a preceding noun. The adjectives were neutral or pleasant in the first experiment and neutral or unpleasant in the second. In both cases, similar ERP patterns were obtained. First, early effects of emotionality emerged (in N100 and P200 components, respectively); second, a grammaticality effect, reflected by higher amplitudes of LAN for mismatched sentences, was also found. The only difference came up at the P600 component: while in the Diaz-Lago et al.'s study (positive/neutral adjectives), main effects of emotionality and grammaticality were found, in the Padron et al.'s study (negative/neutral adjectives), only the grammaticality effect emerged. These results showed, on the one hand, a temporal priority for emotional processing over syntactic processing, and, on the other hand, a lack of interaction between the affective and the grammatical processes throughout the time record.
In order to test the generalizability of this pattern, a new ERP study was carried out using an identical procedure. On this occasion, participants read all three types of sentences (i.e., with positive, negative, and neutral adjectives). Results showed early effects of emotionality (N100/ P100) only in matched sentences, the classical effect of grammaticality around 400 ms (LAN), and, for the first time, an interaction between emotionality and grammaticality in the later stage (P600).We suggest that the interaction may be a result of the joint presence of positive and negative words

Poster Presentation

Counterfactual reasoning and moral elevation

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We report the results of two experiments on counterfactual thoughts and moral elevation. Moral elevation is an emotional reaction to others' acts of moral excellence We examine cognitive processes in moral elevation and the role of counterfactual reasoning as an important component that boosts moral elevation. Moral elevation is usually evoked by witnessing or learning about acts of moral excellence which tend to be both exceptional and unexpected – two characteristics that tend to elicit counterfactual reasoning The experiments we report examine the relation between counterfactual reasoning and moral elevation. Participants read stories taken from newspaper reports, for example, one story was a report from the New York Times about a man who jumped onto the subway tracks to save a person who had fallen there. Participants wrote about the story and we examined their spontaneous generation of counterfactual thoughts about how the situation could have turned out differently. Participants tended to create counterfactuals that imagined how the situation could have turned out worse, and they tended to do so by creating subtractive counterfactuals that deleted events and actions. Participants also completed a moral elevation scale that examined their emotional responses to the newspaper articles and their thoughts about emulating the behavior. We examined the relation between the counterfactual thoughts that participants created and their experience of moral elevation.

Poster Presentation

Words of pain. A norm list of 512 Italian pain-related words

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May words be painful? Personal experience and a few studies suggest that this is indeed the case: processing pain-related words has been found to be associated with enhanced activation of pain-related brain areas and to modulate the perception of noxious stimuli. However, few and rather uncontrolled verbal stimuli were used. We conducted an on-line normative study on 512 Italian words, aiming to create a controlled database of words associated with physical or psychological pain. Words were rated for psycholinguistic (familiarity, AoA, imageability, concreteness, context availability), emotional (valence, arousal) and pain-related variables (painrelatedness, intensity, unpleasantness) (participants=1020). Word frequency, length, N-size were also collected. In addition, a lexical decision experiment was carried out, followed by a free-recall task (N=42). Significant correlations between psycholinguistic variables confirmed the literature. In addition, we found a Ushaped relationship between valence and arousal. More familiar and early-acquired words were judged as more positive; more concrete and context-available words as more arousing. Interestingly, the more intense the pain associated with a word, the more unpleasant it was judged. Less negative pain words were also associated to less unpleasant and less intense pain experiences. More arousing pain words were associated with more intense and unpleasant experiences. Partial correlations showed that the more a word was painrelated, the longer it took to decide whether it was or not a word, and the more it was recalled. More positive and less arousing words were also better recalled.
This work paves the way to the first worldwide systematic study on the pain lexicon. As predictable, the characteristics of pain words partly overlap with those typically observed for negative emotional words more in general. Interestingly, the intensity and unpleasantness directly shaped emotional variables. Encoding and recall as well were affected by pain relatedness.

Poster Presentation

The role of the motivational state in the US preexposure effect with an appetitive procedure

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In a series of experiments, animals received exposure to a sucrose solution. Subjects were then given a flavour preference procedure to test the ability of the sucrose to act as an unconditioned stimulus (US), with a neutral flavour as a conditioned stimulus (CS). Previous work has established that such preexposure retards the acquisition of a conditioned preference The experiments reported here were aimed at exploring the role of the motivational state of the animals (hungry or thirsty) in generating this US preexposure effect. In our initial experiments, some of the rats were maintained thirsty throughout the experiment whereas the others were hungry, and in subsequent experiments the motivational state was changed at various stages between conditioning and test. Results are discussed in terms of theories of the US preexposure effect that make predictions regarding the role of motivational state at various stages of the experimental procedure. Research funded by PSI2012-31641 (MINECO)

Poster Presentation

Processing emotional information from faces and bodies

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When addressing how we judge the emotional state of others the focus traditionally has been on processing emotions via facial expressions. Whilst faces are a prime source of emotive information, other visual information, such as body language can also influence emotional state judgments. Identification of neuronal structures sensitive to body processing (e.g. EBA; Downing et al., 2001) together with evidence that emotions can be perceived by the body when the facial expression is unavailable or ambiguous (e.g. Clarke et al., 2005), supports the importance of bodies in emotion processing. In the current set of studies we aimed to investigate how body information is processed, and the comparative importance information from the face and body have when making overall emotional state judgments. In Experiment 1 the holistic processing of face-body compounds was examined using inverted and misaligned stimuli. In Experiment 2 participants responded to congruent and incongruent face-body compounds under low and high cognitive load conditions. The findings answer if identifying emotions from the face and body vary or are equally cognitively demanding.

Poster Presentation

The influence of negative social emotions on working memory Performances

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The level of analysis here identified is developed within the theoretical conception of shame and guilt introduced by Lewis (1971), more recently adopted by Tangney and Dearing (2002). From this point of view, guilt is an action-focused emotion because it involves self-criticism for a specific action. On the contrary, shame is a self-focused emotion because it discredits the global personal identity. Therefore shame emotion is accompanied by a sense of worthlessness and powerlessness in consequence of a defective self. Guilt is instead followed by the taking on responsibility and by reparative actions. The present work aims at exploring the relationship between negative social emotions and working memory performances. Thirty undergraduate students were randomly assigned to one of these three conditions: direct activation of guilt, direct activation of shame and neutral condition. Before and after the emotional elicitation, a dual-task procedure was assigned to the participants in order to assess cognitive processes related to working memory. Findings show that shame and guilt are intrusive emotions that can interfere with working memory. Specifically, shame seems to be more disrupting than guilt because it is characterized by more substantial deterioration of dual-task performances.The present work provide preliminary guidance for the design of training programs aimed at reducing the negative effects of guilt and shame on the daily activities related to working memory.

Poster Presentation

Session A

Conflict in the Kitchen: Contextual Modulation of the Strength of Affordances

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Recently, human behavior has been considered the product of continuous interactions between perception, cognition and action in which "affordances" (action possibilities the environment has to offer) play an important role. According to this model, multiple action possibilities simultaneously compete for further processing, while external and internal factors (e.g., incoming sensory information, predictions) bias the affordance competition. Consequently, the affordance competition model has various practical implications, for instance the way we act upon a stimulus might differ depending on the immediate environment in which a stimulus is being perceived. However, studies addressing the affordance competition are typically confined to the realms of the lab. In this study we used a stop-task to investigate whether context is able to modulate the strength of affordances We therefore placed participants in an actual kitchen and workshop during electroencephalographic recordings. We observed faster responses towards objects when these objects corresponded with the functionality of the environment. In addition, when responses needed to be withheld context congruent objects evoked greater response conflict, as indicated by an enhanced N200 component.

Poster Presentation

Finger-specific number activations through tactile finger stimulation

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Most individuals use finger counting as a strategy to handle numbers at some point in their development and often until adulthood for certain tasks. Fingers help generating and understanding not only a cardinal meaning ("how many fingers?") but also an ordinal meaning ("which position in a sequence?") because each finger has an ordinal meaning according to its position in the counting sequence. The present study investigates whether activating a mental finger representation affects tactual number perception. We used a Braille device to tactually stimulate adult participants' fingertips of the index, middle or ring finger, one finger per trial, between 2 and 4 times. In separate blocks the fingers of the left and the right hand were stimulated. Stimulation durations varied to un- confound numerosity and time. Participants indicated perceived tactile numerosity by pressing the button assigned to each number and spatial arrangements were balanced over participants. We measured response times and accuracy. Results showed that responses were more efficient for trials in which the number of tactile stimulations corresponded to the stimulated finger with regard to the finger's ordinal meaning within the hand. This congruency effect does not reflect response biases. Our findings therefore show that mental finger and number representations are tightly coupled. They support the idea that finger counting is an essential element of number representations because number processing is affected by finger counting habits until adulthood.

Poster Presentation

The left-right mental time line in Sign Language

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Not a single oral language in the world refers to the left-right spatial dimension when talking about time. Yet literate speakers do conceptualize time as flowing leftwards or rightwards (depending on writing direction), as shown by the left-right space-time congruency effect. In contrast, signed languages do conventionally use the left-right axis to communicate temporal relations. Thus, they provide a rare occasion to test whether conventionalizing a particular conceptual mapping in language, over and above non-linguistic conventions such as writing direction, affects the strength with which that mapping is activated. In the present study we assessed the left-right space-time congruency effect in a sample of users of two signed languages: Spanish Sign Language (SSL) and British Sign Language (BSL), and compared them to hearing Spanish speakers. In spite of the extreme differences in the linguistic use of the left-right time line (highly conventional in SSL and BSL, absolute zero in Spanish), the two groups showed statistically indistinguishable congruency effects. Therefore, linguistic conventionalization has at best a negligible additional influence on the conceptual mapping of time onto left-right space.

Poster Presentation

Visually and aurally presented prime sentences automatically activate our senses

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The modality-switch effect (henceforth MSE) consists in the processing cost typically associated with the shift of attention from one sensory modality to another while discriminating the spatial location of a perceptual signal (Spence et al. 2001). Interestingly, this effect also occurs during conceptual processing, when differentmodality properties for concepts are processed during a property verification task (Pecher et al. 2003, 2004; Marques, 2006, van Dantzig et al. 2008).

We hypothesized that the MSE would be the result of an automatic perceptual simulation and that it would emerge independently of the stimuli presentation's modality. We run an Experiment in which participants were first exposed to a prime sentence describing a light or a sound's perceptual property (e.g., "The light is flickering", "The sound is echoing"), then required to perform a property-verification task on a target sentence (e.g., "Butter is yellowish", "Leaves rustle"). The prime sentence could share (i.e., visual - visual, auditory - auditory; Same modality) or not (i.e., visual - auditory; auditory - visual, Different modality; neutral – visual; neutral – auditory; Neutral modality) the target's modality. Crucially, we manipulated the stimuli's presentation modality: 32 participants were faced with written sentences, while other 32 participants were faced with aurally presented sentences. An ANOVA with Modality (same vs. different vs. neutral) as a within-subject factor and Condition (visual vs. auditory) as a between-subjects factor was performed. Results show a cost when two different modalities alternate, compared to when the same modality is repeated ($p < .001$, $\eta p2 = .485$) with both visual and auditory stimuli's presentations.

We conclude that sensory modalities can be automatically pre-activated through the simulation of either read or listened linguistic stimuli describing visual and acustic perceptual properties. This result supports the embodied and grounded cognition view which claims that conceptual knowledge is grounded into the perceptual system.

Poster Presentation

Are there sound symbolic effects in the processing of words and nonwords?

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Sound symbolism is the systematic association of phonological characteristics of labels and visual aspects of their referents, as when the nonword /kiki/ is associated with a spiky shape and the word /bouba/ with a roundy shape. This phenomenon threatens the assumption that a definitory aspect of language is the arbitrariness of the relation between sign and meaning proposed by Saussure. Sound symbolism is well attested in paradigms where the participants learn new names for objects. It has also been shown to affect the online processing of highly iconic languages such as the sign languages of the Deaf. Onomatopoeias are also more resistant to brain damage. However, only one published study have reported online interactions between sound and shape during the processing of an oral language: Westbury (2005, Brain and Language, 93, 10-19) had participants carrying out a lexical decision on words and nonwords with continuant and plosive consonants presented in either a spiky or roundy frame. He observed a congruency effect only for nonwords (faster rejection times for continuant sounds in a roundy frame, and for plosive sounds in a spiky frame). We hereby report our efforts to replicate and extend those findings. We carried out two close replications of the original study (total N=110), and one conceptual replication in an auditory lexical decision task (N=39) in a different language, Spanish, which also assessed the voiced-voiceless feature. The results did not reveal any clear sound symbolic interactions, neither for words nor for nonwords. We conclude that although sound-shape iconicity may impact learning, as demonstrated in a number of studies, it does not contribute to online word recognition.

Poster Presentation   **Session A**

When Syntax meets Action: Brain Potential evidence of embodied sentence processing

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Research on embodied approaches to language comprehension contrasts with traditional views that consider that syntax is amodal in generating hierarchical, recursive structures. In this study, ERPs were recorded while subjects read compound-sentences which are presented in a segment-by-segment fashion, following the Action-Compatibility Effect (ACE) that proposes that the brain resources used to plan and perform actions are also used in language comprehension. Our aim was to test whether the recursivity and hierarchy represented in a sentence (copulative and relative sentences) is compatible with the way (linear or recursive) the sentences were displayed, or not. One-third of the experimental sentences was made up of two main clauses joined together by coordinating conjunction (copulative sentences), whereas the remaining sentences had a centerembedded subject-relative clause (relative sentences). Half of the relative sentences contained a subject-verb disagreement. Participant's task consisted on pressing a button to get the segments displayed and judging the acceptability of the presented sentences. The way to reveal every segment could be one of either two motor tasks. One consisted on pressing three buttons in a sequential order, i.e. with the right hand in a linear manner, and the other being the same but also including a recursive sequence, i.e. by replacing the button in the middle position with the right foot. We hypothesized that syntactic processing of copulative and relative sentences would elicit separable ERP patterns, depending on the motor tasks, as stated by the ACE paradigm. Main findings revealed an increase in P600 amplitude in response to subject–verb agreement violations in relative clauses when they were displayed with a recursive sequence. This compatibility effect add to growing evidence supporting models of embodied language processing, revealing that the syntactic processing of sentences in the brain overlaps with areas devoted to organize hierarchical and recursive non-linguistic motor movements.

Poster Presentation

Effects of sleep deprivation on sarcasm detection

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Growing evidence indicates that sleep plays a pivotal role on health, cognition and emotional regulation. However, its interplay with social cognition remains an uncharted area of research. In this framework, little is known about the impact of sleep deprivation on sarcasm detection, an ability that, once altered, would inescapably lead to difficulties in everyday peer interactions. This study aimed at investigating whether sleepdeprived participants are able to inhibit their own contextual knowledge to adequately infer the listener's interpretation of sarcastic intent when the listener lacks context knowledge, to the same extent than sleeprested participants. Participants first read a conversation between two friends, followed by the description of an event. Intentionally ambiguous voicemail messages left by one of the friends on the other's phone were then delivered, and participants had to decide if the message will be perceived as sincere or sarcastic by the listener. Messages were uttered in a monotonous tone and subdivided in three categories: sincere (1) or sarcastic but the listener is (2) or is not (3) in possession of enough contextual information to be able to interpret it as sarcastic. A 4th category comprised sarcastic messages similar to the 3rd category but uttered in a sarcastic tone. In the sleep-deprived condition, reaction times increased for all categories as compared to the rested-sleep condition, unless a sarcastic tone was used. However, accuracy was preserved in all conditions. These results suggest that adding prosodic cues may compensate for increased processing difficulties in sarcasm detection after sleep deprivation.

Poster Presentation

Normative and personal strengths and weaknesses with gifted children

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Based on Cattell-Horn-Carroll (CHC) theory of cognitive abilities, the Kaufman Assessment Battery for Children – Second Edition (KABC-II) include the Fluid-Crystallized Index (FCI) and 5 scales: Short-Term Memory (Gsm), Visual-Spatial Thinking (Gv), Long-Term Retrieval (Glr), Fluid Reasoning (Gf) and Comprehension-Knowledge (Gc).

In view of the giftedness problematic, the gifted children have frequently shown scores above the average for all scales, except for Glr. However, few studies focused on the personal strengths and personal weaknesses.

The goals of this current study were to present normative and personal comparisons with gifted children and nongifted children.

Eight girls and twelve boys from the French-speaking part of Switzerland were administered the 10 KABC-II subtests (mean age = 134 months; SD = 19 months). The nongifted children were 1202 children of standardization sample of the French KABC-II.

As expected, the gifted children showed normative strengths (i.e, 116 to 130) on Gv, Gc and Gf. In contrast, the performances for Glr and Gsm were similar between gifted and nongifted children. Results showed that 70%, 65%, 60%, 65%, and 80% of gifted children had normative strengths for Gv, Gc, Gf, Glr, and Gsm, respectively. Concerning personal strength and weakness, most of gifted children presented personal strength on Gv (50%) and Gc (45%) while most of gifted children presented personal weaknesses on Glr (60%) and Gsm (45%).

In conclusion, although Glr and Gsm are often normative strengths, these are most often personal weaknesses.

Poster Presentation

The effect of audio-visual synchronization in reading while listening to texts: An eye-tracking study

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Reading while listening (RWL) consists in reading a text while one can hear a narrator spelling the text aloud. RWL has been shown to be more efficient than reading only or listening only to the text, especially for comprehension and reading fluency in poor readers. We developed a RWL application that allows words to be highlighted exactly when they are spelled, in a synchronized, karaoke-like way. Adults and middle school students read 12 stories that each contained one pseudoword repeated exactly four times. Half of the texts were presented in a classic, non-assisted RWL condition (NA) and the other half was synchronized. The subjects were instructed to follow the text according to the narrator's pace while also paying attention to the stories. They were unexpectedly tested on their memory for the pseudowords' orthographic form and semantic category, and for the stories. The categorization was improved by the synchronization whereas the two other tasks were not influenced by it. Notably, the subjects mostly preferred the NA condition, and the proportion of subjects preferring the synchronized condition seemed to be influenced by visual features that affected the ease of reading, such as the letters' color or the relative asynchrony between a word's highlighting and its enunciation onset (0 ms or a visual advance of 300 ms). The subjects' eye movements were recorded during reading. They revealed that the words were fixated less often but longer in the synchronized compared to the NA condition. In addition, from their first to their fourth occurrence in the texts, the pseudowords were fixated for a shorter amount of time. In light of these results, educational applications using synchronized RWL, in audio-books for instance, seem promising.

Poster Presentation

Making causal inferences in L2 sentence comprehension: An ERP study

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Understanding a sentence often requires going beyond what is explicitly said. For example, when reading the two sentences "Joey's brother became furiously angry with him. The next day his body was covered in bruises", one has to infer that Joey's brother hit him to establish coherence in the discourse. We adapted Kuperberg et al.' study (Kuperberg, Paczynski, & Ditman, 2011) to investigate whether late bilinguals make causal inferences during second language (L2) sentence comprehension, like native speakers (Keenan et al., 1984; Kuperberg et al., 2011; Myers et al., 1987). Using event-related brain potentials (ERP) we recorded the brain activity of 20 English native speakers and 22 Spanish-English late bilinguals while they were reading scenarios in which the final sentence was highly causally related (a), intermediately related (b), and causally unrelated to its context (c).

Example: "The next day his body was covered in bruises" preceded by
(a) "Joey's brother punched him again and again."
(b) "Joey's brother became furiously angry with him."
(c) "Joey went to a neighbour's house to play."

Participants were asked to assess whether it was easy/medium/difficult to relate the third sentence to the previous ones. Analyses of the behavioural responses revealed no significant differences between the groups. In contrast, the preliminary analyses of the ERP data on the critical noun ("bruises") revealed different patterns. Both groups showed a reduced N400 component in the highly related condition compared to the other two conditions (with a gradual effect in native speakers, as reported in Kuperberg et al.). In addition, the L2 group revealed an early and a late positivity in the intermediately related and unrelated conditions. These results suggest that inferences influence semantic processing in L2, like in L1. However, it seems that extra processing is involved when inferring meaning from a situation in L2 discourse comprehension.

Poster Presentation

Explicit and implicit modality effects in language processing

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Modalities play an important role during language processing. On the one hand, there is an explicit use of sensory modalities (auditory for spoken language vs. visual for written language) and motor modalities (vocal for spoken language vs. manual for written language), which can be combined as compatible (auditory-vocal or visual-manual) or incompatible (auditory-manual or visual-vocal) combinations. On the other hand, language processing always implies an implicit integration of modalities via the modality-reference of the concept. In terms of embodied cognition theories, it is assumed that conceptual knowledge is grounded in the sensorymotor system and language comprehension and production is strongly influenced by the simultaneous activation of the semantically related sensory-motor cortex. In the present study, we investigated explicit as well as implicit modality-effects in language processing in a series of task-switching experiments. Participants had to switch explicitly between compatible or incompatible sensory-motor modality combinations during a semantic categorization, in which they had to categorize modality-related words (e.g., "reading") with regard to their implicit modality-reference (e.g., ear-related vs. eye-related word). The results revealed a significant effect of the explicitly used sensory-motor modality combination. Switching between incompatible combinations led to longer reaction times, higher error rates, and higher switch costs than switching between compatible combinations. Additionally, we found an influence of the implicitly activated modality (via the modalityreference of the stimulus). Whenever there was an accordance of the semantics of the stimulus with a currently used sensory or motor modality (e.g., a visual presentation of an eye-related word like "reading") we found a facilitation effect in the form of numerical shorter reaction times. Taken together, the results indicate that performance in language processing is influenced by the combination of explicitly used sensory-motor modalities as well as by implicitly activated modalities due to modality-references of the concept.

Poster Presentation

Inter-hemispheric interaction in lexical ambiguity processing

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Although the left cerebral hemisphere (LH) is predominantly involved in language processing, recent evidence suggests an important role for the right hemisphere (RH) due to its semantic capabilities. The present study explored inter-hemispheric interaction (IHI) during a lexical decision task using bilateral presentation of stimuli within a divided visual field experiment. Previous studies have shown that compared to unilateral presentation, the bilateral redundant presentation decreases the inter-hemispheric asymmetry and facilitates the cooperation between hemispheres. The present study used unbalanced homonymous and metaphorically polysemous words to investigate hemispheric cooperation when processing ambiguous words. Verbal stimuli were presented bilaterally (left and right visual hemi-field simultaneously) while the relationship between target and distractors was manipulated. The target words were either homonyms or metaphors (or non-words) and the relations were either: a target word replicate, a pseudo word, a word related to the dominant meaning of the ambiguous target, a word related to the subordinate meaning, an unrelated word, or a string of the letter x. Overall, target words presented with a replicate showed the fastest reaction times and lowest error rates while the pseudo word condition showed the slowest reaction times and highest error rates. An interaction between ambiguity type and semantic relation suggested differential processing of metaphors and homonyms. In particular, metaphorical targets paired with a word related to their subordinate meaning were processed significantly slower pointing to increased processing demands in this condition. Crucially, the results revealed no visual field advantage suggesting increased involvement of the RH in the processing of the ambiguous targets. Thus, in concordance with previous studies, the inter-hemispheric asymmetry was decreased, suggesting cooperation between the hemispheres. The results have implications for current models of IHI and indicate that cooperation between the two hemispheres is related to semantic information during lexical processing.

Poster Presentation

Statistical learning of auditory center-embedded recursive structures

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A growing body of research has shown that with the help of different facilitative cues, humans are able to learn complex hierarchical structures with center-embedded recursion, such as the sentence "The student that the teacher that the rector praised helped improved". Increasing evidence indicates that properties of learning input have an impact on learning this type of recursion. For instance, as regards to the ordering of the learning input, a number of studies found a starting small effect, which refers to the facilitation of learning by staged input. Recently, a study observed participants performed better in learning an artificial language with centerembedded recursion, when the complexity of their training input was in an incremental increase and in an unequal frequency distribution. However, most of previous studies have investigated the learnability of input with center-embedding in the visual modality, whereas only few studies examined the processing of auditory input. In the current study, we conducted an experiment with artificial grammar learning paradigm. Participants were first trained to listen to an artificial language with center-embedded structures, and then they were required to make grammatical judgments on novel test items generated by the same grammar rule. We manipulated the composition of the training set and compared how different groups of participants would process the same test set. We test: 1) whether participants are able to learn an auditory center-embedded recursive structure. 2) whether the facilitative cues (the ordering cue and the frequency distribution cue) are attuned to auditory modality. Our current results not only replicated the staged input learning effect with visual input, but also successfully demonstrated the learning of auditory sequences with center-embedded recursion. We showed that the repetition of a smaller set of unique learning exemplars can facilitate learning, and an unequal number of repetition could enhance learning more robustly.

Poster Presentation

Frequency and phonological relatedness across dual tasks

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The aim of this study is to highlight how the human system of language copes with dual task situations, in which the orthographical/phonological and phonemic representations of two concurrent stimuli compete each other to be selected as correct response to be pronounced at the given task. In the word-word interference paradigm (WWI) we asked participants to read a target word presented below or above a simultaneously central distractor word (Experiment 1). In the picture-word interference paradigm (PWI) we asked them to name a target picture simultaneously presented with a printed distractor word on it (Experiment 2). Target frequency and target-distractor phonological relatedness were varied in both the behavioural studies. Names with low values vs. high values of frequency were chosen for the target stimuli set. Distractor words that shared the first two phonemes vs. phonologically unrelated distractors were chosen as stimuli for the distractor stimuli set. Interaction was found; the target frequency effect disappeared when the stimuli were onset phonologically related. High frequency targets were named faster than low frequency ones and targets belonging to onset phonological related stimuli couples were named faster than those belonging to the unrelated ones. Both the tasks have shown these results. These data suggest that the speech production and reading aloud systems share those dynamics that regulate the phonological and phonemic activations of two simultaneous lexical entries. Overall the human system responsible for speech production and reading is more flexible (i.e. in the structural and functional dynamics of activation/inhibition involved) than the DRC model. Computational simulations using the Semantic version of the DRC model will be compared to human data and discussed.

Poster Presentation

How deaf are French speakers to stress?

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This ERP study examined whether French listeners use stress at a phonological level when discriminating between stressed and unstressed words in their language. Participants heard trials of five words and made same/different decisions about the final word (male voice) with respect to the four preceding words (different female voices). Compared to the first four context words, the target word was (i) phonemically and prosodically identical (chou vs. chou; control condition), (ii) phonemically identical but differing in the presence of a primary stress (chou' vs. chou), (iii) prosodically identical but phonemically different (chaud vs. chou), or (iv) both phonemically and prosodically different (chaud' vs. chou). Differences on the P200 and N200 components were observed when the target word differed from the context words in stress and when it differed in phoneme compared to the control condition. Moreover, on the N200 component more negativity was observed when the target word differed in phoneme than when it differed in the presence of primary stress. Crucially, our results suggest that French listeners are fully capable of creating a representation of stress that is more abstract than previously claimed on the basis of behavioral studies. Pre-lexical processing may thus involve abstraction processes not only for segmental/phonemic information but also for suprasegmental features such as stress even in French, a language in which stress is not lexically contrastive.

Poster Presentation

Orthographic processing and lexical access in patients with schizophrenia: Analysis of the N170 component

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Reading has been proposed among the cognitive functions affected in schizophrenia. Studies reported that reading fluency and accuracy, as well as phonological processing was impaired in patients relative to controls (Martinez et al., 2013; Revheim et al., 2006, 2014). However, previous studies nearly always used standardized tests of word processing to observe those deficits. In a diagnostic assessment perspective of reading skills of patients with schizophrenia, our aim was to determine how they process written words, and the origin of their cognitive deficits. In the present study, we explored the efficiency of orthographic processing and lexical access in patients with schizophrenia compared to controls. In order to achieve this, we analyzed the early N170 component in a lexical decision task, in which lexical frequency and bigram frequency were orthogonally manipulated. Preliminary results in the control group showed a lexical frequency effect on the N170 component, with larger amplitudes for rare than for frequent words. Moreover, we observed an interaction between bigram and lexical frequencies: for frequent words only, amplitudes were larger for words with low-frequency bigrams than for words with high-frequency bigrams. Data for patients with schizophrenia are still being collected.

Poster Presentation

Learning to read aloud versus learning to comprehend: The impact of training focus on behavioural and neural responses to artificial scripts

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Theories propose that reading is accomplished via two pathways, one that maps from print to sound to meaning, and one that maps print directly to meaning. We investigated whether teaching adults to read artificial orthographies using different training regimes would alter the functional and neural division of labour between these two pathways. 24 native English-speaking adults learned to read two sets of 24 novel words (e.g., buv, sig), written in two different unfamiliar orthographies. Print-to-sound mappings were systematic, and print-to-meaning mappings constituted arbitrary associations with familiar nouns. Participants completed six tasks every day for nine days: three print–sound tasks; reading aloud, spelling, rhyme judgements, and three print–meaning tasks; saying the meaning (e.g., camel, tractor), selecting written word associated with picture, semantic judgements. For one orthography they completed print–sound tasks three times per day and print–meaning tasks only once per day, whereas for the other orthography the reverse focus was applied. Before and after training, neural activity was measured with fMRI whilst adults viewed the trained words. Accuracy was > 80% on all six tasks for both orthographies by the end of training. Reading aloud and spelling of trained and untrained words was faster and more accurate and faster if training had a print–sound (relative to a print–meaning) focus. Saying the meaning, word–picture association, semantic judgements, and recognition memory were equally accurate but faster if training had a print–meaning (relative to a print–sound) focus. Furthermore, print–sound versus print–meaning training differentially impacted on occipitotemporal, and inferior parietal responses to the written words after training. Thus, the way in which we learn to read has a profound impact on the efficiency of reading accuracy and comprehension, and on how our brains respond to written words.

Poster Presentation   **Session A**

Bilinguals' lexical interactions between languages in monolingual contexts

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Although previous studies have contributed a great deal to the understanding of bilingual word recognition, little is known about the influence of seemingly monolingual contexts in bilingual lexico-semantic access. This ERP investigation examined bilingual word processing in a single language context by manipulating the orthographic similarity of the stimuli within- and between-languages. Basque-Spanish bilinguals completed a picture-word matching task. The critical stimuli were pseudowords that could be either related or unrelated to the word corresponding to the reference picture in both languages (e.g., the picture of a dog followed by "purro"[derived from "perro", dog in Spanish], by "txekur" [from "txakur", dog in Basque], by "raloj" [from "reloj", clock in Spanish], or by "erlaju" [from "erloju", clock in Basque]). Pairs of picture-word were added in which words could be either all in Spanish or all in Basque determining the target language for the whole experimental session. In Experiment 1, balanced bilinguals were tested. Behavioral results showed a larger relatedness effect for within-language pseudowords than for between-language pseudowords. In the N400 time-window, a generalized effect of relatedness was found, with even a larger effect for within-language pseudowords. In Experiment 2, we tested unbalanced bilinguals (i.e., more dominant in one of the two languages). The overall results replicated the previous findings. Critically, language dominance modulated the relatedness effects. When participants completed the task in their dominant language, the N400 was larger for within-language pseudowords than for pseudowords derived from words from the non-target language. In contrast, when the target language context was the non-dominant one, similar relatedness effects were found for both types of pseudowords. Overall, these results highlighted that the language context modulates the strength of lexical interactions between languages in bilinguals, which in turn depend on the internal organization of the lexicon of each individual bilingual based on their language dominance.

Poster Presentation

The effect of gaze direction on verbal short-term memory

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Earlier research suggested that gaze direction has an impact on cognitive processing. It is likely that gaze directed to the left or right increases activation in specific areas of the contralateral cerebral hemisphere. Consistent with the lateralization of memory functions, we previously showed that shifting gaze to the (upper) left improves visuo-spatial short-term memory. In the current study, we investigated the effect of unilateral gaze on verbal processing. In the literature, there is no consensus on brain asymmetries for verbal memory. An advantage of the right hemifield was expected because language is lateralized on the left. Also, an advantage of the upper hemifield was expected because local processing and object recognition are facilitated in this hemifield (in contrast to global processing in the lower hemifield). However, the results with brief presentations in the vertical or horizontal hemifields were mixed. The goal of our study was to investigate whether vertical or horizontal asymmetries would occur when observers were asked to look at the upper, lower, left, or right part of the screen while they performed lexical decision and lexical gender discrimination tasks. We did not observe differences between gaze directed to the left or right, but shorter RTs when observers looked at words in the upper than in the lower part of the screen. Our results confirm that horizontal asymmetries for verbal memory are not reliable, even with strongly righthanded males. However, vertical asymmetries seem to be more reliable (with both males and females) suggesting a functional specialization of the upper visual field for verbal processing.

Poster Presentation   **Session A**

Effects of age of acquisition in second language reading: Results from an eye-tracking corpus

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Effects of the age of acquisition (AoA) of words on visual word recognition have been well-established, mainly in behavioral tasks and to a lesser extent in eye-tracking studies. However, the majority of these studies were limited to investigating the mother language (L1) of participants. In the current study we want to investigate AoA effects in a second language (L2). For L1, large databases with AoA ratings for thousands of words are available. However, such ratings are non-existent for L2. A first step in this study was thus to gather such ratings. A group of Dutch – English bilinguals rated 1700 English nouns on their L2 AoA. These nouns are part of a natural reading database of eye movements for Dutch – English bilinguals. Therefore, we can insert these ratings as a variable in our analyzes of the eye movement data. The goal of this study is threefold. First, we want to confirm an L2 AoA effect in eye-tracking, supporting previous behavioral studies which found such an effect. Second, we want to investigate if there are differences between L1 and L2 effects of AoA in the eyemovement data. Third, we want to contribute to the discussion on the origin of AoA effects: the direction of L2 AoA effects could be an important marker to provide evidence for one of two hypotheses. If L2 AoA effects are according to the L2 AoA ratings, we would provide evidence for the mapping hypothesis. However, effects that follow the L1 AoA ratings (the ratings of the translation of the words) would point in the direction of the semantic hypothesis.

Poster Presentation   **Session A**

Second-order false-beliefs, language and autism: a pilot training study

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The developmental links between linguistic abilities and false-belief reasoning skills are now well-established. But such studies have mostly focused on the first-order case; there is relatively little research on the link between language and second-order reasoning. Furthermore, we know of no training studies on the role of language skills in the development of second-order false-belief reasoning in autistic individuals. The goal of our project is to investigate these capacities.

Logical formalizations of second-order false-belief tasks have indicated the importance of perspective-shifting and embedding in such reasoning. These considerations have led us to design a between-subjects empirical study for 7-12 year old Danish native speaking children diagnosed with Autism Spectrum Disorder. We first intend to measure correlation effects, and then to establish causality via training.

Subjects will be given two types of second-order false-belief task, in an attempt to distinguish between the rival "conceptual-change" and "complexity-only" positions on second-order false-belief. To investigate the role of embedding skills, subjects will be tested and trained in comprehension of linguistic recursion (e.g., multiple embeddings, nested possessives). Similarly, to investigate the role of perspective-shifting, a novel Danish language test, developed by linguists at Copenhagen University (Boeg Thomsen and Engberg-Pedersen) will be used. This gap-filling test is based on mini-scenarios. It measures mastery of three Danish discourse dialogue particles (jo, da, vel). Correct usage indicates whether the subject fully grasps how the scenario's characters mutually understand one another.
The study is in the pilot testing stage at the moment.

Poster Presentation

Alignment in shared processing of linguistic and Musical structure : Behavioral and Electrophysiological evidence

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There seem to be strong analogies between the structural processing of sequences in language and music, suggesting that there are domain-general resources that allow for abstract structure processing (cfr. Patel, 2003 SSIRH). This (shared-resouce) hypothesis is supported by interference in the simultaneous processing of structural unexpectancies. However, is there also a demand on domain-general syntactic processing resources in the more ecologically valid situation without such unexpectancies? To test this, we provided syntactically sound sentences and pitch phrases, which either did or did not align with each other's hierarchical compositional structure. Participants silently read sentences with either a low (50%) or a high (50%) relative clause attachment structure (e.g., "I see the tables of the room that was / were old"). Though such attachment sentences are ambiguous, there are no strong expectations concerning the preferred syntactic structure. The sentence was presented in 8 sentence fragments, which were each accompanied by a pitch. The resulting pitch sequences had a first structural shift which aligned with the beginning of the prepositional phrase. Counterbalanced across sentence type, half of the pitch sequences also included a structural shift back to the root of the pitch sequences aligning with the start of the relative clause. A pitch sequence that included the second structural shift would structurally align with the presentation of a high attachment sentence, yet be structurally incongruent with a low attachment sentence. A behavioral experiment revealed that a structural incongruency between both domains significantly (p < 0,01) decreased the structural processing effects found in a melodic recognition task. An EEG study demonstrated eRAN and N5 components in this incongruent condition. Both components are taken to reflect structural processing of melodic stimuli. These experiments thus provide evidence for a shared pool of structural integration resources for both domains (Patel, 2003) using structurally sound stimuli.

Poster Presentation

Event-related potentials of bilingual figurative language processing

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ERP research into figurative language comprehension has shown the graded N400 effect with the most negative amplitudes to anomalous, less negative to novel metaphoric, then conventional metaphoric, and finally literal utterances, which seems to reflect the difficulty of lexical access (Arzouan et al., 2007). Yet, little attention has been devoted to examining the neurophysiological correlates of metaphoric language processing in the bilingual context. ERP experiments on semantic processing in bilingualism have shown an attenuated or delayed N400 effect to non-native language (L2) compared to the native (L1) tongue (Moreno & Kutas, 2005). While the reduction in the N400 amplitude in L2 was interpreted as reflecting less automatic lexical access, the N400 latency shift was correlated with language dominance and L2 proficiency level. Our experiment aimed at investigating how proficient bilingual speakers of Polish (L1) process metaphoric meanings in English (L2). The participants were asked to perform a semantic decision task to novel metaphoric, conventional metaphoric, literal, and anomalous word dyads in Polish and English. ERP analyses revealed a main effect of language within the 360-420 ms time window (p = .01), with reduced N400 amplitudes to L2 compared to L1 utterances. This effect suggests less automatic lexical expectancy, and less efficient lexical access in L2 compared to L1, even when bilinguals are highly proficient in their L2. A main effect of utterance type was observed within the 440-500 ms time window (p = .031), showing an increasing trend from literal utterances, to conventional metaphors, novel metaphors, and anomalous utterances. Post hoc tests revealed that anomalous word pairs evoked a greater N400 effect compared to literal utterances (p = .004) and conventional metaphors (p = .042). These results indicate that although generally reduced in L2, the N400 amplitudes to anomalous and metaphoric utterances reveal the same graded effect in both languages.

Poster Presentation   **Session A**

The influence of visual context and it-clefts on ambiguous pronoun processing in Norwegian children

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Using eye-tracking, we investigate how ambiguous pronoun processing is influenced by visual context and cleft sentences. We aim to reveal at which age Norwegian children learn to follow these cues in the same way as adults.

The participants were 3-, 5- and 7-year-old monolingual Norwegian children, as well as an adult control group. They listened to subject-clefts (e.g., "It is the tiger that tickles the bear") or object-clefts (e.g. "It is the bear the tiger tickles"), while watching two illustrated animals on a screen. These were shown either performing the action (e.g., tickling) or not. Thereafter, the participants heard an ambiguous pronoun sentence (e.g., "He can count to ten"). We collected online and offline data to determine whether the participants preferred the subject or the object as the pronoun referent.

We expected to find a subject preference that grows stronger as the children grow older (Jarvikivi et al., 2013) We also expected young children to rely more on visual context than older children, who would be more sensitive to syntactically expressed focus (Bittner & Kuehnast, 2011).

In our preliminary results, adults showed a general subject preference offline and online, specifically after subject-clefts offline. In addition, they seemed to process the pronouns faster than the children. We found a stronger subject preference in 5- and 7- year-olds after subject-clefts than object-clefts online, but not offline. They thus seem to be less consciously aware of their subject preference than adults are. The 3-year-olds showed no specific preferences, and we found no effect of visual action in the children overall. In the adults, however, visual action interacted with clefting. They showed a subject preference in all of the conditions except when object-cleft was paired with no visual action, probably because this leaves the subject without syntactic focus and with no visual support.

Poster Presentation

Indirect request comprehension requires additional processing effort: Apupillometry study

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In an appropriate context, "It's cold in here" is a request to shut the window, rather than a statement about room temperature. A problem for theories of language comprehension is how listeners comprehend this indirect meaning. Most theories agree that, at least for the above example, listeners engage in inference processes to understand the intended message. This is supported by recent fMRI studies. Although these studies are informative regarding the neural infrastructure for IR comprehension, they provide little information about the processing effort involved. In two experiments we used pupillometry to investigate increases in processing demands for comprehending indirect requests (IRs) as compared to statements. Increases in pupil diameter have been taken as an index of increases in processing demands. We predicted that if understanding IRs involves effort beyond that entailed in understanding mere statements, pupil diameter should increase. Participants were presented with 120 picture-sentence combinations while their pupil sizes were recorded. Sentences could either be interpreted as IRs (e.g. a picture of a window with "it's very hot here") or as statements (e.g. window with "it's very nice here"). In Experiment 1, participants indicated on each trial whether or not they heard an IR. In Experiment 2, no task was performed and participants were not told IRs could be present in the experiment. Analyses were conducted using linear mixed-effects models. For Experiment 1, participants correctly identified the IRs and pupil diameter was larger for IRs than statements. These results suggest that 1) pupil diameter was sensitive to our pragmatic manipulation and 2) IR comprehension requires cognitive effort beyond that necessary for comprehending statements. In Experiment 2, participants did not recognize the IRs and they did not show an increase in pupil diameter for IRs. This highlights the importance of studying indirect request comprehension in different contexts.

Poster Presentation   **Session A**

Effects of musical experience on sound feature processing in quantity language speakers

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Musical training and native language processing have been shown to be linked in the brain at various levels from behavioural responses to cortical electrical potentials and to the brainstem. Previous research has focused on enhancements in pitch processing found in speakers of tone languages, e.g. Mandarin, and on similar enhancements for pitch processing in trained musicians. The interaction between effects of native language and musical training is not well understood. To investigate this further, we took native Finnish speakers of a variety of musical experience scores from the Goldsmiths Musical Sophistication Index and compared their behavioural sound feature discrimination thresholds as well as auditory brainstem responses to sounds in order to understand the relation between conscious sound perception, brainstem response, and music experience. Our group has recently shown that speakers of quantity languages like Finnish, in which word meaning depends on phoneme duration, show neural changes on the level of the auditory brainstem that correspond with the phonological features of the language: Finnish speakers show enhanced amplitude to sounds due to more synchronized brainstem responses compared to German speakers, reflecting the enhanced precision of duration processing necessary to speak Finnish. Finnish speakers also have better behavioural duration discrimination but show a more extreme perceptual coupling between pitch and duration, i.e., they are more influenced by pitch when making duration judgments. Here, we ask whether musical experience is associated with less or more extreme perceptual coupling of pitch and duration, i.e. whether music training allows people to better separate acoustic features, or whether it leads to a more efficient but less distinct mechanism. Preliminary results suggest a complex relationship between musical sophistication, brainstem response, and perceptual sound feature discrimination with much variation between individuals, even of the same language group, that could be due to other environmental or genetic factors.

Poster Presentation

Increased lip corticobulbar excitability during the perception of non-native phonemes

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Listening to native speech has been shown to activate not only auditory regions, but also motor regions, as measured by corticobulbar excitability. However, it is not known if the motor activity is driven by experience with the speech sounds. In that case, motor activity should diminish when listening to non-native speech, for which we lack both sensory and motor experience. In the present experiment we test if listening to non-native speech engages the motor system by recording corticobulbar activity of the lip and tongue muscle from 17 participants when listening to German vowels. Some vowels were native-like in the language of the participants, Italian (/a/, /i/, /u/), and others were non-native (/y/). Additionally, we related the corticobulbar excitability to perception tasks (nativeness ratings of the vowels and similarity ratings between the vowels) and production measures (tongue height, tongue backness and lip electromyography (EMG)) related to accuracy (mean) and uncertainty (standard deviation) when participants produced the German vowels. Results showed an increase in lip corticobulbar excitability for a combination of both lip use during articulation and nonnativeness: from the lowest activation for /a/ (native-like, no lip use) to /i/ and /u/ (native-like, lip use during articulation) to the highest activation for /y/ (non-native and lip use during articulation), with significant differences between the extremes (/a/-/y/). Furthermore, lip corticobulbar excitability was negatively correlated with the nativeness ratings and positively with the uncertainty of lip movement during production of the same vowels (measured by the standard deviation of the lip EMG). These results suggest that participants engage the motor system more strongly when listening to perceptually and articulatory unfamiliar vowels. We suggest that the motor system may play an active role during the perception of non-native speech sounds and might compensate for not having an existent acoustic-motor representation.

Poster Presentation   **Session A**

Sonority as a phonological cue for syllable segmentation in French: Evidence from a short-term longitudinal study using the illusory conjunction paradigm

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In French, research suggests that syllables are early and robust prelexical and segmental units during reading acquisition. However, most research dedicated to the role of the syllables in silent reading focused on its statistical and distributional properties to account for the syllable effects. But is syllable segmentation still possible when no clear and reliable statistical and distributional information is available? We proposed that the sonority – a universal phonological element – might be a reliable source for syllable segmentation. More specifically, we studied whether (how and when) French children are sensitive to universal sonority-related markedness within the syllable boundaries. We therefore designed a short-term longitudinal study to track the developmental changes in the use of the syllables and the sensitivity to sonority-related markedness cues. Forty French-speaking children participated. They were subdivided into "good" and "poor" readers and tested three times (April - October - April). We used an adapted version of the illusory conjunction paradigm. The orthographic and phonological statistical and distributional properties were null or quasi-null around – and within – the syllable boundary, while sonority-related markedness was manipulated along a continuum from legal, phonotactically-unmarked clusters (e.g., lv) to illegal, phonotactically-marked ones (e.g., zr). Our results are innovative: syllable segmentation strategies depend on sonority-related markedness in the absence or quasi-absence of statistical and distributional information. As markedness decreases, children better detected the syllable boundaries (lv > dg > jr), while as markedness increases, children promoted syllable onsets (jr > dg > lv). This suggests that segmentation strategies do not only depend on a strict statistical and distributional analysis. While this universal phonological sensitivity is available at an early age and does not depend on reading level and sonority-unrelated features, syllable segmentation abilities basically develop with reading experience but are quicker available in "good" than in "poor" readers.

Poster Presentation

A diffusion modeling account of length effects in lexical decision in German- English bilinguals

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The word length effect in lexical decision is well documented. It is typically reported to be inhibitory for pseudowords, i.e. leading to longer reaction times with increasing length. Findings for words, however, are mixed, ranging from slightly inhibitory to facilitative. Moreover, the length effect depends on the language under study. Specifically, length effects are larger in consistent orthographies, such as German, than in opaque orthographies, such as English. Here, we used diffusion modeling (DM) to map the effects of length in German and English to the cognitive sub-processes underlying the lexical decision process. The DM is a prominent approach to the analysis of reaction time (RT) data, which models the whole RT distribution rather than mean RTs only. By taking the whole RT distribution into account, this model allows disentangling measured RTs into evidence accumulation and decision-independent encoding processes. Mean RT analysis showed a decrease in RTs with word length for pseudo-words only, but no length effect for real words. However, the DM approach showed that the null effect for real words resulted from opposing influences of length on non-decision time and rate of evidence accumulation. Non-decision time increased with length for words and pseudo-words, whereas the rate of evidence accumulation increased with length for real words but decreased for pseudo-words. The comparison between DM parameters in German and English map effects of orthographic transparency onto decision-independent encoding processes, whereas effects of length onto rate of evidence accumulation are likely to reflect differences in word length distributions in the two languages.

Poster Presentation

Neural correlates of lexical ambiguity: are polysemous and homonymous words represented differently?

J. Haro[1], P. Ferré [2], J. Demestre[3], B. Vallès[4]

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Language is plenty of words that refer to more than one meaning (that is, ambiguous words). Understanding how these words are represented and processed is necessary for a complete explanation of human language. Consequently, the study of lexical ambiguity has contributed importantly to the development of psycholinguistics. For example, as ambiguous words show a particular one-to-many relation between orthography and semantics, they have been very useful to test and improve models of word recognition. But this one-to-many relation is not the only interesting fact about ambiguous words: they also vary in how their meanings are related, so they can be classified into homonyms if their meanings are unrelated (e.g., bat) or polysemes if their meanings are related (e.g., newspaper). Several studies have analysed if these two types of ambiguous words are represented and processed differently, obtaining opposite results in the lexical decision task: whereas some of them obtained an advantage for polysemous words in comparison to homonyms and unambiguous words (e.g., Rodd, Gaskell, & Marslen-Wilson, 2002), others did not (e.g., Hino, Pexman & Lupker, 2006). Thus, the aim of present study is to test if polysemous and homonymous words are processed and represented differently, by providing both ERP and behavioural measures. We conducted a lexical decision study in which participants were presented with polysemous, homonymous and unambiguous words. Importantly, the selection of these words was based in subjective norms, in contrast to other ERP and behavioural studies (e.g., Klepousniotou, Pike, Steinhauer, Gracco, 2012; Rodd et al., 2002). Our results showed differences between polysemous and homonymous words in the N400 component, although response times were similar between them.

Poster Presentation

High-level reading skills in young adult bilinguals: Inferential updating and semantic integration in the L1 and L2

L.B. Hansen[1], A.I. Pérez[2], M.T. Bajo[1]

[1]Universidad de Granada, Exerimental Psychology, Spain
[2]Universidad de Granada, Experimental Psychology, Spain

Previous research on bilingualism has demonstrated less efficient semantic processing (reflected in a smaller N400 effect) in the bilinguals' L2 compared to their L1 at the sentence level. The present research aims to explore the processes of inferential updating (P3b) and semantic integration (N400) in bilinguals' L1 and L2, during text-level reading comprehension. Twenty-four highly proficient young adult late bilinguals read short narratives in their L1-English and L2-Spanish. The first three sentences of each narrative facilitated inference of a specific concept (e.g., 'fight'). The fourth sentence brought one of three continuations: a neutral sentence, which did not refer back to the facilitated concept; a 'no update' sentence, which contained information consistent with the concept (e.g., '…more and more agressive'); and an 'update' sentence, which contained information that was inconsistent with the previously inferred concept, therefore facilitating a new inference (e.g., '…very convincing in their roles').Compared to the L1, L2 reading times were longer in the no update condition, suggesting a lower capacity to infer the facilitated concept in the L2. The final sentence ended in a target noun consistent with the new inference facilitated in the update condition (e.g., 'play'). ERPs indicate that bilinguals were able to update their initial incorrect interpretation (P3b) and integrate the semantic information (N400) in both languages, although these processes were less efficient in the L2. In addition, individual differences in working memory (operation span task) and attentional control (AXCPT task) abilities accounted for differences in both high-level reading processes. To our knowledge, this is the first study investigating inferential updating and semantic integration at the text level in bilinguals.

Poster Presentation

Comparing the effects of exercise, rest and sleep on memory for newly learned words in adulthood

T. Margary[1], G. Finlayson[1], H. Nash[1], A. Weighall[1]

[1]University of Leeds, School of Psychology, United Kingdom

Memory for newly learned words benefits from overnight consolidation, implicating sleep (Gaskell & Dumay, 2007). However, sleep may not be the only condition under which memory consolidation may occur. Neuroimaging studies have reported increases in hippocampal blood volume after exercise associated with verbal memory improvements (Hillman, Erickson & Kramer, 2008) and vocabulary learning is boosted by exercise compared to a rest condition (Winter et al., 2007). Furthermore, verbal memory improves after a short unfilled break, suggesting 'wakeful rest' may aid memory consolidation by reducing post-learning interference (Dewar at al., 2012). Our study represents the first attempt to examine effects of exercise and rest on word learning. By assessing integration of new words into the lexical network we examine whether exercise can, like sleep strengthen memories. Forty adults learned 24 spoken novel words and then either exercised gently on treadmill (exercise) or stood still (rest). Explicit memory (cued recall) and implicit lexical integration (pause detection) were tested immediately, after the interval, and the following day enabling examination of the immediate and longer lasting effects of exercise on retention and consolidation. At time 1 (immediately after training, before interval) there was no evidence of lexical competition for either group. At time 2 (after interval, 10min walk vs. 10 min rest) competition emerged for the exercise group, but not rest. At time 3 (the following day when all have slept) both groups showed equivalent competition effect. Furthermore, whilst a boost was not observed on cued recall for either group following the interval, the expected boost to memory was observed the following day when both groups had slept and the magnitude of this effect was significantly greater in the exercise condition. The results suggest that brief low impact exercise may boost consolidation enabling competition effects to emerge swiftly and before sleep.

Symposium   09:00 – 11:00 | Room: Akamas B

Attention and working memory: commonalities and differences

N. Cowan[1], N. Friedman[2], R. Logie[3], V. Camos[4], S. M. Jaeggi[5], M. Husain[6]

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Invited Symposium co-sponsored by ESCOP and the Psychonomic Society. Attentional control and working memory are two of the most important and well-studied constructs in the fields of cognitive psychology and neuroscience. While in the past attentional control and working memory were mainly studied in isolation, in the last decade there has been a surge of research aiming to shed light on the nature of their intertwined relation. Working memory is highly limited and attention is thought to control what information is encoded and maintained in working memory in the face of competing information. At the same time, working memory representations have been shown to drive attentional capture. Thus, behavioural and neurophysiological evidence suggest that these two processes share overlapping cognitive and neural mechanisms. Yet, the limits of their commonalities and differences are still not well understood, and the term 'working memory' is used to refer to different concepts by different research groups: some view attention and working memory as nearly synonymous; others view attention as one function among a range of functions that comprise working memory. This symposium aims to bring together scientists studying the interaction of these two constructs through different methodologies and age ranges to discuss current knowledge and open questions on the topic.

Symposium Abstracts

09:00 – 09:20

The focus of attention as a highlighter of perceived and of stored information

N. Cowan[1]

[1]University of Missouri

In this talk, I will make the case that the relation between attention and working memory is asymmetric. Attention can highlight perceptual input so as to make it more lasting in working memory. Both the intensity and the duration of the allocation of attention are important to form a persistent working memory representation. Attention is important for a thorough, systematic memory representation including the binding of elements together. Attention is also important for retaining the elements, but they are less dependent on attention than is the binding information, proportionally speaking. These points will be made with a combination of tasks that lead to both attention sharing and attention switching between multiple stimulus elements or channels.

Symposium Abstracts

09:20 – 09:40

Protection and flexible updating of representations in memory

M. Husain[1]

[1]University of Oxford

How does attention interact with working memory? It might be fair to say that part of the problem with such a question is that neither attention nor working memory is a singular, monolithic process. So the answer depends very much on the specific domains under scrutiny. In this talk, I'll discuss recent findings using recall precision as an index of visual short-term memory. Responses measured within a continuous, analogue space (rather than binary yes/no reports) provide a potentially more sensitive means to probe interactions between attention and working memory. Results from paradigms using this methodology have revealed that systems we commonly refer to as visual attention might play a key role in both protecting the contents of working memory as well as flexibly altering and updating priority states of items maintained in memory. These findings have important consequences for state-dependent models of WM.

Symposium Abstracts

Genetic influences on attention and working memory

N. Friedman[1]

[1]University of Oxford

The unity/diversity model describes the relations among three executive functions that are commonly thought to reflect attentional control and working memory (response inhibition, working memory updating, and task switching). Individual differences in all three abilities are influenced by a common factor (unity), which is isomorphic with response inhibition ability, and updating and switching abilities are also influenced by their own specific factors (diversity). I will present findings from two independent longitudinal twin samples measured at different ages that have implications for understanding the relationship between attention and working memory: the unity and diversity components are highly heritable and stable by late adolescence, reflect separate genetic and, to a lesser extent, environmental influences, and relate differently to other cognitive and non-cognitive measures. I will then discuss what cognitive and neural mechanisms may be captured by these factors, particularly the hypothesis that the common factor reflects the ability to actively maintain goals in working memory and use them to bias ongoing processing.

Symposium Abstracts

Attention as work, not memory in working memory

R. Logie[1]

[1]University of Edinburgh

Pylyshyn (1973) noted that not all functional mental operations are necessarily conscious, and not all conscious experience is necessarily functional. The concept of attention often refers to conscious control, suggesting some form of homunculus in overall charge of cognition. This raises the obvious question of what controls the homunculus and so on, leading to an unhelpful infinite regress. Moreover, an important distinction is between attention required for interaction with the external world, and the cognitive functions that support processing and temporary storage in working memory. Our experience of cognitive functions might not reflect how those cognitive functions are actually achieved in the brain. The conscious experience of attention to cognition may be the product, not the function, of multiple, parallel, and largely non-conscious mental operations that process, encode, store, retrieve, plan, and solve problems. Conscious experience may give only indirect and imprecise indications of how those mental operations go about their business. I will present empirical evidence from younger and older healthy adults and from individuals with specific working memory impairments demonstrating that temporary storage in working memory does not appear to be constrained by attention to cognition. This evidence will be used to argue that the work in working memory comprises interactions among multiple specialised cognitive functions, but that memory in working memory is supported by passive, domain-specific temporary storage systems that do not require attention to function.

Symposium Abstracts

10:20 – 10:40

Attentional and non-attentional maintenance in working memory

V. Camos[1]

[1]Université de Fribourg

Working memory is the structure devoted to the maintenance of information at short term during concurrent processing activities. In this respect, the question regarding the nature of the mechanisms and systems fulfilling this maintenance function is of particular importance and has received various responses in the recent past. In the time-based resource-sharing (TBRS) model, we suggest that only two systems sustain the maintenance of information at the short term, counteracting the deleterious effect of temporal decay and interference. A non-attentional mechanism of verbal rehearsal, similar to the one described by Baddeley in the phonological loop model, uses language processes to reactivate phonological memory traces. Besides this domain-specific mechanism, an executive loop allows the reconstruction of memory traces through an attention-based mechanism of refreshing. The present paper reviews evidence of the involvement of these two independent systems in the maintenance of verbal memory items.

Symposium Abstracts

Underlying mechanisms of working memory training – the role of interference resolution and attentional control

S.Jaeggi[1]

[1]University of California, Irvine

My talk will summarize the results of several working memory training studies demonstrating transfer to higher cognitive abilities, such as reasoning and problem solving. We have observed such effects in various populations across the lifespan, ranging from typically developing children to older adults. I will argue that one of the reasons that certain working memory interventions are effective is because they specifically target interference resolution and attentional control processes. Indeed, we typically observe the strongest effects in measures assessing those functions. Our findings have implications in that they suggest a common factor that underlies performance in both, working memory and reasoning, and furthermore, they provide evidence for the malleability of attentional control functions.

Symposium   09:00 – 11:00 | Room: Akamas B

Automatic and strategic processes in the Stroop effect

A. Henik[1], M. Augustinova[2], D. Sharma[3], W. Notebaert[4], J. Tzelgov[4], L. Goldfarb[5]

[1]Ben-Gurion University of the Negev, Psychology, Israel
[2]CNRS & Universite Blaise Pascal, Laboratoire de Psychologie Sociale et Cognitive, France
[3]University of Kent, School of Psychology, United Kingdom
[4]Gent, Experimental Psychology, Belgium
[5]University of Haifa, Learning Disabilities, Israel

Cognitive neuroscientists use conflict situations to study selective attention. One major task that has assumed a paradigmatic role throughout the years is the Stroop task. This task (and other similar tasks) has been used to study automaticity, control, emotion and deficits due to illness or brain injury. John Ridley Stroop suggested that the task he designed examined automaticity. However, as expected it seems that the task is prone to both automatic and strategic processes. The current symposium will revolve around these (automatic and strategic) aspects of the Stroop task.

Symposium Abstracts

Regulation of the conflict adaptation effect by emotion

D. Sharma[1]

[1]University of Kent, School of Psychology, United Kingdom

A number of recent studies have shown that emotion can moderate the control of cognitive conflict on Stroop tasks. Much of this work suggests that positive mood, compared to negative or neutral mood, reduce cognitive control. This has been demonstrated by a reduction in the conflict adaptation effect with positive mood induction. Recently Padmala, Bauer and Pessoa (2011) embedded irrelevant negative and neutral images in between trials on a face-word version of the Stroop task. They reported that negative images, compared to neutral images, can also reduce cognitive control. In our research we report on two studies. First, a direct replication of Padmala et al's study that demonstrates further support for their finding that negative images reduce cognitive control. In a second study we show that the conflict adaptation effects are similar for irrelevant positive and neutral images.

Symposium Abstracts

Symposium Abstracts

The influence of response modality (manual vs. vocal) in the Stroop task

M. Augustinova[1]

[1]CNRS and Universite Blaise Pascal, Psychology, France

It is generally admitted that the response modality makes a difference in the Stroop task such that manual responses produce less interference than vocal responses. This response-modality effect seems somewhat self-obvious within single-stage response competition accounts that have historically been favored in the Stroop literature (see MacLeod, 1991) as the distinct response modalities are assumed to (unsurprisingly) exert distinct effects at the response output. The scarce empirical work situated within multiple-stage accounts suggests that the influence of response modality in the Stroop task is potentially more complex (Sharma & McKenna, 1998; see also Brown & Besner, 2001; Risko, Brown & Besner, 2006). The experiments I will present in this paper were designed to further address this (largely unexplored) issue. To this end, Responsemodality (manual vs. vocal) and Stimulus-type (color-neutral signs vs. color-neutral words vs. color-associated words vs. standard color-incongruent words) varied systematically. This more fine-grained manipulation of Stimulus-type that is typical of multiple accounts allows for assessing of the extent to which the lexical, semantic and response processing respectively are influenced by the response modality. Results from Experiment 1 were in agreement with past research. Indeed, manual responses produced less interference than vocal responses and this reduction was due to differences in response processing (as assumed by singlestage response competition accounts). However, contrary to such a single locus, this response-modality effect also resulted from important differences in lexical but not in semantic processing. Results from Experiment 2 in which Response-modality was manipulated within-participants replicated this exact pattern of results and extended it to Stroop facilitation. Thus, these results not only point to the viability of multiple-stage accounts of Stroop interference but also to the commonalities of processes underlying Stroop interference and facilitation that are often considered as unrelated phenomena.

Symposium Abstracts

The dynamics of control in the Stroop task

W. Notebaert[1], C. Bundt[1], E. Abrahamse[1], M. Ruitenberg[1]

[1]Ghent University, Experimental Psychology, Belgium

By means of mouse tracking we investigated the dynamics of motor and cognitive control in a Stroop task. Participants had to move the cursor as fast as possible to one of the four target locations on top of the screen on the basis of the stimulus color (word irrelevant). Motor control was investigated by means of an implicit 8- element sequence while cognitive control was measured by means of the item-specific proportion congruency effect. Trials with sequence were faster than random trials (1197 ms vs 1219 ms) and this was also reflected in mouse trajectories. More specifically, the maximal deviation from the perfect mouse trajectory was larger on random trials. This suggests that implicit knowledge of the sequence resulted in more direct trajectories. There was an overall Stroop effect, which was reflected in RTs and virtually all movement parameters and the same was true for the proportion congruency effect which showed a larger congruency effect for mostly congruent items (174 ms) compared to mostly incongruent items (84 ms). Trajectory differences between congruent and incongruent items were also more pronounced for mostly congruent items. For mostly congruent items the distortions for incongruent items are maximal (more x flips, more maximal deviation and more area under curve). This suggests increased capture by the irrelevant word in mostly congruent items.

Symposium Abstracts

The role of the task conflict in the Stroop effect

L. Goldfarb[1]

[1]University of Haifa, The Edmond J. Safra Brain Research Center for the Study of Learning Disabilities, Israel

In the Stroop task participants are asked to name the color of a stimulus. The stimulus can be a color word that is congruent or incongruent to the ink color or a neutral stimulus such as color patch, string of letters or noncolor word. It has been suggested that congruent Stroop stimuli cause more task conflict than neutral stimuli because the anterior cingulate cortex, which is activated when conflicts arise, is activated more with these stimuli. In contrast to findings of brain studies, behavioral studies usually imply that the congruent condition causes the same or less conflict than the neutral condition. Commonly, RT for the congruent condition is faster or similar to the RT for the neutral condition. This talk will introduce the behavioral expression for the task conflict in the congruent condition using the task control reduction technique. With the task conflict theory in mind and the current technique, the task conflict will be further examined in a population with deficient control abilities- schizophrenic patients. This provides more support for the task conflict theory and create a complete theory supported by normal behavioral studies, neuroimaging and patient studies.

Symposium Abstracts

Interaction between inherited and situational factors of cognitive performance in the Stroop Color-naming task

 A. Szekely[1], A. Vereczkei[2], B. Gönye [2], J. Bircher[2, 3], E. Kotyuk[3], R.E. Katonai[2, 3], M. Gyurkovics[3], S. Maruzsa[3], K. Varga[3], J.M. Duchek[4], D.A. Balota[3], M. Sasvari-Szekely[5]

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[4]Washington University in St. Louis, Department of Psychology, United States
[5]Semmelweis University, Department of Molecular Chemistry, Molecular Biology and Pathobiochemistry, Hungary

There are substantial individual differences in cognitive performance. Results from twin and molecular genetic studies indicate that inherited factors play an important role in shaping these differences. In the post-genomic era unique genetic components of cognitive functioning have been established, including dopaminergic gene variants. Previously we explored inherited components of individual variation in attentional functioning, and reported significant association (p=0.0001) between the DRD4 VNTR polymorphism and response latencies (Szekely et al., 2011). When testing cognitive performance researchers often assume that subjects are focused on the task, alert and optimally motivated. However, some theories (Revelle, 1993) point out, that personality traits combine with situational features to produce motivational states that in turn affect the information processing system at several different stages. Inherited individual differences can further modify performance outcomes. The main focus of our current research was to explore the interplay of genetic components and non-inherited factors of cognitive performance (e.g. task difficulty, motivation, level of arousal). Reaction time and correctness measures were collected from several hundred university students while performing a Stroop Color-naming test. After completing a baseline condition of this task we introduced a motivated condition by promising a small gift for those who out-perform themselves. Electrodermal activity and self-report personality measures were also collected. DNA samples were collected to determine candidate genetic variants related to neural mechanisms of cognitive functioning and the reward system. Multivariate analyses of genetic, personality and situational factors suggest that the effect of genetic factors on cognitive performance interacts with trait impulsivity and motivational characteristics of the situation. Our results illustrate that physiological and cognitive performance measures derived from speeded tasks with situational characteristics of different motivational states could be promising tools to highlight gene-environment interaction effects in the background of cognitive abilities. This work was supported by the Hungarian Scientific Research Fund (OTKA-K100845).

Symposium Abstracts

On the "what" and the "how" of control of the Stroop effect

J. Tzelgov[1], Y. Levin[2], O. Entel[3]

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[2]Ben-Gurion University of the Negev, Psyhology, Israel
[3]Achva Academic College, Psyhology, Israel

In the late seventies of the previous century, the Stroop effect, although seen as a paradigmatic example of automatic processing, was shown to be sensitive to control. In a series of studies we decomposed the various conflict components contributing to the Stroop effect and manipulated the sensitivity of each component to control. Of particular interest were task conflict and informational/response conflict. Note that task conflict is the marker of automatic reading. Our results consistently showed that control of the Stroop task was triggered by the presence of informational/response conflict. It follows that automatic processing can be controlled but such control depends on the presence of response conflict. These findings are consistent with the architecture common to many models of control monitoring.

Symposium

09:00 – 11:00 | Room: Akamas C

Current methods and advances in prospective memory research

N. Rothen[1, 2], J. Rusted[2]

[1]University of Sussex, Psychology, United Kingdom
[2]University of Bern, Psychology, Switzerland

Prospective memory involves the self-initiated retrieval of an intention upon the encounter of an appropriate retrieval cue. Crucially, prospective memory cues are embedded in an ongoing activity and hence, can be missed without realising. Successful prospective memory retrieval can either occur spontaneously (accompanied by a pop-up experience) or as a result of strategic monitoring (accompanied by a search experience). While the field of prospective memory research is steadily growing since the 1990s, also its methodical approaches recently have begun to diversify remarkably. The goal of this symposium is to capture the rich methodology of the field and to highlight the respective advantages and insights gained by means of their application. Specifically, we will explore how different approaches enhance our understanding of the implicit and explicit cognitive experience of prospective memory retrieval across adulthood. In six talks we explore computational modelling and online data collection techniques; the impact of nonmodifiable (genes) and modifiable (stress-related cortisol; induced arousal states) physiological factors on PM response; the underlying neural signalling of PM response captured through peripheral (skin conductance) and central (fMRI and evoked potential) measures. While the presented findings are specific to the field of prospective memory research, the symposium more generally provides a broad overview on the different methods available to cognitive psychology and highlights their specific advantages and the kind of research questions that can be investigated by means of their application.

Symposium

Symposium Abstracts

Contributions of sensory and higher order cortical areas in prospective memory

N. Sigala[1, 2]

[1]Brighton and Sussex Medical School, Department of Psychiatry, United Kingdom
[2]Sackler Centre for Consciousness Science, University of Sussex, United Kingdom

The sensory recruitment model proposes that visual working memory (WM) is maintained in sensory areas and facilitated by top-down control from the prefrontal cortex (PFC). We hypothesised that in synaesthesia the WM network, including visual and prefrontal areas, would show higher efficiency and reduced activity, while in ageing it would show the opposite pattern. We tested three groups of healthy volunteers (young, older and young grapheme-colour syneasthetes) in a delayed pair-associative task (DPA) and a delayed matching-tosample (DMS) task. We employed black-and-white fractal stimuli that do not induce synaesthesia and tested the participants behaviourally and with fMRI. The synaesthetes showed no behavioural advantage (accuracy, response times) relative to young and older adults either in the DMS or in the DPA task. However, whole-brain and region-of-interest-analyses showed significantly lower activity in the synaesthetes' middle frontal gyrus and visual regions (cuneus, inferior temporal cortex) respectively, suggesting greater neural efficiency relative to young and older adults in both tasks. Subjective visual imagery correlated with visual regions during WMmaintenance and with retrieval accuracy in synaesthetes, but not in young and older adults. These results advance the sensory recruitment model, suggesting that enhanced sensory-perceptual functions (as in synaesthesia) facilitated a number of cognitive mechanisms, including WM, visual imagery and associative retrieval.

Symposium Abstracts

09:20 – 09:40

Electrophysiological evidence of top-down and bottom-up processes in prospective memory

P. Bisiacchi[1], G. Cona[2]

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[2]University of Padua, Department of Neuroscience, Italy

Prospective memory (PM) represents the ability to successfully realize intentions when the appropriate moment or cue occurs. In this study, we used event-related potentials (ERPs) to explore the impact of predictability of the cue on cognitive and neural mechanisms supporting PM. We particularly focused on strategic monitoring.in 2 two studies. In the first one we studied PM cues predictability. The behavioral and ERP correlates of strategic monitoring - represented by PM interference effect on RTs and sustained ERP activity over lateral frontal regions - were observed for the predictable condition only in the ongoing trials wherein the PM cue was expected, whereas, for the unpredictable condition, they were shown throughout the whole PM block. This pattern of results suggests that, in the predictable condition, participants engaged monitoring only when they entered in a context wherein the PM cue was expected, and disengaged monitoring when the PM cue was not soon encountered. On the contrary, in the unpredictable condition, participants devoted resources to strategic monitoring in a more continuous manner. In the second study we used event-related potentials (ERPs) to explore the effect of age on the neural correlates of monitoring processes involved in time-based prospective memory. In both younger and older adults, the addition of a time-based prospective memory task to an ongoing task led to a sustained ERP activity broadly distributed over the scalp. Older adults, however, did not exhibit the slow wave activity observed in younger adults over prefrontal regions, which is considered to be associated with retrieval mode. This finding indicates that age-related decline in intention maintenance might be one source of the impaired prospective memory performance displayed by older adults. An 'anterior shift' in scalp distribution of the P3 was observed in older adults, and was related to lower levels of accuracy in prospective memory performance.

Symposium Abstracts

Prospective memory and stress-dependent cortisol secretion: Are we less affected when we are old?

M. Kliegel[1], K. Schnitzspahn[1], C. Kirschbaum[2]

[1]University of Geneva, Psychology, Switzerland
[2]TU Dresden, Psychology, Germany

Acute stress activates the hypothalamus pituitary adrenal axis resulting in the increasedrelease of cortisol. If cortisol reaches the central nervous system, it influences multiple brain structures known to be associated with cognitive performance. Accordingly, acute psychosocial stress has been shown to impair declarative memory retrieval,working memory and cognitive control in young adults. So far, only very little empirical research is availableconcerningpossible adult age differences inacute stress effectson cognition in general and cognitive control in particular. Accordingly, the present study set out to test these effects in a controlled laboratory setting comparing performance in a prospective memory task in 66 young (19-34 years) and 57 older adults (60-82 years) exposed either to an established psychosocial stress procedure or an active control condition. Stress responses were measured on a fine-grained level across the entire procedure using subjective and physiological stress markers. Results suggest that the stress induction was equally successful in both age groups. Interestingly, while prospective memory was reduced under stress in the young adults, cognitive performance in the older adults was not influenced by acute stress. This missing stress effect in the older adults may be due to more effective and cognitive less effortful emotion regulation and age-related changes in the frontal lobes possibly reducing the responsiveness to acute cortisol elevations.

Symposium Abstracts

Does the impact on prospective memory of carrying the APOE e4 gene vary with age and cognitive state?

J. Rusted[1,] S. Evans[2], C. Lancaster[1], N. Rothen[3], Y. Nagai[4]

[1]Sussex, psychology, United Kingdom
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[3]University of Sussex, Psychology, United Kingdom
[4]Brighton and Sussex Medical School, Clinical Imaging Sciences Centre, United Kingdom

Apolipoprotein E epsilon4 is a variant of the polymorphic protein associated with increased risk for dementia in later life. Earlier work suggested that as young adults, carriers of this allele actually outperform their non-carrier peers on some cognitive tasks, including prospective memory (PM). Here we report two studies exploring the purported PM advantage in young adult e4 carriers following manipulations of arousal via a) biofeedback and b) cognitive challenge, combining conventional behavioural measures with subjective and objective indices of arousal. The data suggest that e4 carriers do not invariably manifest an advantage in performance, but that where an advantage occurs, it is associated with a better distribution of resources across the components of the PM task. Intriguingly, this advantage was more pronounced in the focal than the nonfocal PM blocks, consistent with an earlier report of genotype differences in focal PM performance in older e4 carriers. The studies also provide evidence suggesting e4 carriers are more adversely affected by heightened arousal states than their e3 counterparts, but that they may be more likely to demonstrate enhanced arousal in response to cognitive challenge. The data will be discussed in relation to the heightened brain activation patterns previously reported in young e4 carriers in fMRI data, and the notion that the e4 allele associates with early life advantages that promote 'burn out' and a steeper trajectory of cognitive ageing.

Symposium Abstracts

Linking real-world prospective memory, experimental tasks, and underlying mechanisms: Evidence from computational modelling and online webbased testing

S. Gilbert[1]

[1]University College London, Institute of Cognitive Neuroscience, United Kingdom

A fundamental aim of research into prospective memory is to link our ability to fulfil delayed intentions in everyday life to underlying computational processes implemented in the human brain. Despite the enormous progress made in the last 25 years in developing cognitive theory based on experimental tasks performed in the laboratory, the links between such tasks and A) real-world behaviour, and B) underlying computational processes, are relatively poorly understood. In this talk I will present some data suggesting the utility of online web-based experimentation and computational modelling for understanding links A and B respectively. In particular, I will argue that online experimentation provides an effective methodology to link performance on batteries of experimental tasks with participants' ability to fulfil delayed intentions embedded within their everyday activities over the course of days or weeks, with large sample sizes. Further, I will argue that computational modelling can provide a useful bridge between behavioural data obtained from experimental tasks and underlying cognitive mechanisms (and their neural correlates). These studies suggest that experimental tasks are significant, but relatively weak, predictors of real-world behaviour, and that their performance involves a division of labour between mechanisms that represent the content of delayed intentions and 'content-free' representations.

Symposium Abstracts

Psychophysiology of prospective memory: The effects of autonomic arousal and cue-focality on prospective memory retrieval

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Successful prospective memory retrieval leads to an increase in skin conductance (i.e., suggesting higher autonomic arousal). However, it remains to be shown how exactly prospective memory retrieval affects skin conductance responses (SCRs). Hence, we investigated how autonomic arousal and cue-focality affect prospective memory performance. In line with previous research, we found better prospective memory performance for focal than non-focal cues and increased SCRs for prospective memory hits in comparison to misses. Moreover, we were able to confirm that focal prospective memory cues are more readily processed in comparison to non-focal cues by demonstrating increased SCRs for prospective memory hits in the focal condition in comparison to the non-focal condition. Furthermore, on a behavioural level, we found evidence that states of increased autonomic arousal can also increase prospective memory performance. Overall, the study demonstrates the potential of measuring SCRs in advancing our insights about prospective memory processes.

Symposium

Big data approaches to understanding visual word recognition

K. Rastle[1], M. Brysbaert[2], D. Crepaldi[3], K. Nation[4]

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Recent years have seen rapidly changing methods of evidence gathering in psycholinguistics. These changes reflect the increasing use of large laboratory-based experiments (mega-studies) to investigate particular phenomena; the use of crowdsourcing as opposed to laboratory-based methods to enhance sample size and composition; and the enhanced use of text corpora to develop psychologically-meaningful constructs. This symposium will present new developments in the use of these "Big Data" approaches to understanding visual word recognition. The first talk (Rastle) presents a new mega-study database designed to enhance our theoretical understanding and computational modelling of reading beyond the monosyllable. The second talk (Mandera) presents a massive online crowdsourcing experiment (over 10 times larger than any existing mega-study) and assesses vocabulary test data from it against data from the existing Lexicon Projects. The third talk (Stevens) reports a series of small-scale virtual experiments within existing mega-studies to determine how large a sample must be to avoid spurious effects. The fourth talk (Crepaldi) presents new corpus-based analyses to refine our understanding of the effects of word frequency on visual word recognition. Finally, the fifth talk (Nation) will present a new corpus of children's written language; this corpus is used to extract psychologically-meaningful measures of linguistic experience which enhance our understanding of orthographic development. Discussion will consider how these new approaches can be used most effectively to advance our theoretical understanding of visual word recognition and its development.

Symposium Abstracts

Moving beyond the monosyllable in models of skilled reading: Mega-study of disyllabic nonword reading

K. Rastle[1], B. Mousikou[1], J. Sadat[2], R. Lucas[2]

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More than 90% of English words are polysyllabic, yet the vast majority of research on reading aloud has focused on monosyllables. We conducted a large-scale study in which 41 participants read aloud 915 disyllabic nonwords. Participants' reading aloud latencies, pronunciations, and stress placements were compared where possible to the performance of rule-based (DRC; Rastle & Coltheart, 2000) and probabilistic (CDP++; Perry et al., 2010; Seva et al., 2009) computational models of reading aloud. Nonwords yielded an average of six pronunciations each, with variability across participants strongly determined by the spelling-tosound consistency of onset and rime units. Stress placements were influenced by a combination of orthographic and phonological cues, as well as spelling-to-stress consistency of onset and rime units. RTs were influenced by pronunciation and stress uncertainty across participants, as well as other item-level orthographic factors. The computational models under consideration showed a good fit to the human data in respect of stress assignment, with stress uncertainty within the probabilistic models strongly related to stress uncertainty across participants. Furthermore, the models showed a reasonable fit to the human data in respect of nonword pronunciations, even though they yielded a number of pronunciations that no participant produced. We discuss several ways in which the data constrain further development of these models.

Symposium Abstracts

Can reaction times from massive online experiments be used to study visual word recognition?

P. Mandera[1], E. Keuleers[1], M. Stevens[1], M. Brysbaert[1]

[1]Ghent University, Department of Psychology, Belgium

Behavioural data collected using simple experimental paradigms and involving large numbers of stimuli are becoming increasingly popular as a basis for testing psycholinguistic theories. Such experiments performed in traditional laboratory settings are also called megastudies (e.g. Balota et al., 2007; Keuleers, Diependaele, & Brysbaert, 2010; Keuleers, Lacey, Rastle & Brysbaert, 2012). As an extension to the laboratory megastudy approach, we conducted several online lexical decision experiments, in which we collected responses from hundreds of thousands of participants using a variety of devices. In contrast to laboratory megastudies the data collected in our studies cover a large variety of demographic groups in terms of age, educational level, degree of multilingualism, geographical location, etc. It is clear that the accuracy data from these studies can yield important insights in theoretical questions in psycholinguistics (Keuleers, Stevens, Mandera, & Brysbaert, in press), but it is not yet known to which extent the chronometric data collected in these studies can also be used for psycholinguistic research. In this talk we will present a first analysis of the massive amount of reaction time data collected in our online studies. In particular, we will address the question whether RTs from massive online experiments can be a reliable source of data for testing psycholinguistic hypotheses. We will examine whether the size of the dataset alleviates potential problems originating from diminished control over the datacollection procedure and whether theoretically meaningful comparisons can be made for participants in different demographic groups.

Symposium Abstracts

How spurious can you get? Charting the sensitivity and specificity of typical psycholinguistic experiments with megastudy data

M. Stevens[1], P. Mandera[2], E. Keuleers[2], M. Brysbaert[2]

[1]Ghent University, Department of Psychology, Belgium   [2]Ghent University, Department of Experimental Psychology, Belgium

A common complaint is that psychological experiments are underpowered, so that researchers are tempted to use creative data handling in order to get 'promising' trends across the significance threshold. Because of the high noise level there is also a considerable possibility of publishing spurious effects. Power analysis helps to avoid these problems, but it is often difficult to translate a typical experiment into the exact parameters needed for the analysis. We make use of a priming study published by Adelman et al. (2014), to estimate the power of a commonly used design (which can be generalized to other similar designs). The megastudy data involved a primed lexical decision task with 28 priming conditions, 420 items and 1020 participants. Priming effects of up to 30 ms (Cohen's d=0.16) were observed. By sampling various stimulus and participant samples from these data, we get realistic estimates of erroneous conclusions and we can compare them to the values predicted on the basis of classical power analysis. Full-scale analyses are still ongoing, but it is now already clear that a typical experiment with 20 participants, 60 items and three repeated measures conditions indeed leads to the low power that has given rise to the criticism: 0.30 for F1, 0.25 for F2 and a meager 0.05 for minF'. Mixed effects analyses with random slopes have a comparable power of around 0.25. In this talk, we will present for the first time a table showing how many stimuli/participants one needs in order to examine priming effects of various sizes, and to what extent it is possible to offset a limited number on one parameter (participants or stimuli) with a larger number on the other parameter.

Symposium Abstracts

Quality, not quantity: Register is more important than size in corpus–based frequency estimation

D. Crepaldi[1], S. Amenta[1], P. Mandera[2], E. Keuleers[3], M. Brysbaert[2]

[1]University of Milano Bicocca, Department of Psychology, Italy
[2]Ghent University, Department of Experimental Psychology, Belgium
[3]Ghent University, Department of Psychology, Belgium

Recent evidence has shown that word frequency estimates provide a better fit to experimental data when they are based on movie subtitles, as compared to other sources such as books or written text gathered from the Internet (Brysbaert & New, 2009). Following this seminal paper, others have provided converging evidence from different languages (e.g., Cai & Brysbaert, 2010; Keuleers and Brysbaert, 2010). In this paper we will present subtitle frequency estimates for Italian (SUBTLEX–IT) based on ~130M tokens, and we will validate them: (i) in both a lexical decision task and a more ecologically realistic eye tracking, sentence reading study; and (ii) both against a smaller (~4M tokens) corpus based on edited text (CoLFIS; Bertinetto et al., 2005) and a larger (~2B), web–crawled database (itWaC; Baroni et al., 2009). By doing so, we will yield three new contributions to the field. First, we will show that giant databases such as itWaC do not necessarily provide higher–quality frequency estimates, thus suggesting that register (i.e., quality) is more important than size (i.e., quantity). Second, we will show that eye tracking, sentence reading data allow validation of frequency corpora just as well (or even better) than lab tasks such as lexical decision. Third, we will use these higher–quality frequency measures to assess the role of this variable (taken as a sign of lexical involvement) during the various stages of visual word identification in sentence reading.

Symposium Abstracts

Contextual diversity, not frequency, predicts children's word reading accuracy

K. Nation[1], B. Vandekerckhove[1], J. Ricketts[2]

[1]University of Oxford, Department of Experimental Psychology, United Kingdom
[2]Royal Holloway, University of London, Department of Psychology, United Kingdom

Frequency is a strong item-level predictor of reading aloud performance and it features in most theoretical accounts of word reading and its development. Frequency (the number of times a word occurs in a corpus) is highly correlated with the contextual diversity of those encounters, with higher frequency words being associated with encounters that are more contextually and semantically diverse. Using a large corpus of children's written language, we computed contextual diversity for items appearing in the Diagnostic Test of Word Reading Processes (comprising 30 regular words and 30 irregular words) for which we had reading aloud data from 350 children aged 6-13 years). Contextual diversity predicted reading success beyond frequency. In contrast, frequency did not predict reading success beyond contextual diversity. These findings suggest that (a) frequency effects may be a consequence of contextual diversity and (b) the linguistic environment in which children encounter words during their reading experience serves to shape orthographic development, with words encountered in more diverse semantic contexts enjoying a processing advantage,even in isolated word tasks such as reading aloud.

Symposium   09:00 – 11:00 | Lara A-B

What Bayesian methods can do for cognitive science

E. Wagenmakers[1], R. Morey[2], J. Vandekerckhove[3], C. Morey[4], E. Vergauwe[5]

[1]University of Amsterdam, Department of Psychological Methods, Netherlands
[2]Cardiff University, School of Psychology, United Kingdom
[3]University of California, Irvine, Department of Cognitive Sciences, United States
[4]The University of Edinburgh, School of Philosophy, Psychology and Language Sciences, United Kingdom
[5]University of Missouri, Psychological Sciences, United States

Bayesian statistical methods offer several critical advantages over classical methods. The classical framework focuses on rejecting null hypotheses on the basis of "surprising" data and offers no methods for accepting hypotheses, quantifying evidence, or probability statements about theories or models. Bayesian methods are based on sequential updating of knowledge, allow for the inclusion of prior knowledge, have the capacity to deliver support for the null, and have default methods to quantify the degree of support for any hypothesis. The speakers will introduce the Bayesian framework together with recently-developed software tools for its easy application. Further presentations will demonstrate by example how Bayesian approaches permit novel conclusions that are relevant for cognitive scientists. The examples will involve the use of priors and Bayesian model averaging, and statistical inference through Bayes factors and posterior intervals.

Symposium   09:00 – 11:00 | Lara A-B

Symposium Abstracts

JASP: A Fresh Way to do Statistics

E. Wagenmakers[1]

[1]University of Amsterdam, Psychological Methods, Netherlands

Bayesian hypothesis testing presents an attractive alternative to p-value hypothesis testing. The most prominent advantages of Bayesian hypothesis testing include (1) ability to quantify evidence in favor of the null hypothesis; (2) ability to quantify evidence in favor of the alternative hypothesis; and (3) ability to monitor and update evidence as the data come in. Despite these practical advantages, Bayesian hypothesis testing is still relatively rare. An important impediment to the widespread use of Bayesian tests is arguably the lack of userfriendly software for the run-of-the-mill statistical problems that confront psychologists for almost every experiment: the t-test, ANOVA, correlation, regression, and contingency tables. Here we introduce JASP (http://jasp-stats.org), an open-source, cross platform, user-friendly graphical software package that allows users to carry out Bayesian hypothesis tests for standard statistical problems. JASP is based in large part on the Bayesian analyses implemented in Morey and Rouder's powerful BayesFactor package for R. Armed with JASP, the practical advantages of Bayesian inference are only a mouse click away.

Symposium Abstracts

The misalignment of scientific thought and statistical practice: deep problems and workable solutions

R. Morey[1]

[1]Cardiff University, Psychology, United Kingdom

In recent years, psychologists have been re-examining the methods they use for inference. I argue that scientists tend to think in an evidential way about statistics: that is, statistics provide provide reasons to change ones' beliefs, and are used to convince others within an argument. However, the statistical theory on which scientific practice is based is non-evidential, and there is no clear link between how scientists think about statistics and the statistics that scientists actually use. This leads to arbitrary interpretations of common statistics: is a p value of .1 evidence for the null, no evidence at all, or some evidence against the null? Is p=.05 more or less evidence when the sample size is larger, or always the same? How much more convincing is p=.01 than p=.04, and why? The lack of obvious connection between how scientists think and their formal statistical training should make scientists uncomfortable. I suggest that Bayesian statistical philosophy provides a way for scientists to unite their thinking with their practice, and highlight several benefits of Bayesian statistics, including the most important: it gives us a sense of the limits of our scientific claims, and of human knowledge in general.

Symposium Abstracts

A Bayesian framework for publication bias mitigation using behavioral process models

J. Vandekerckhove[1], M. Guan[2]

[1]University of California, Irvine, Department of Cognitive Sciences, United States
[2]University of California, Irvine, Cognitive Sciences, United States

The reliability of published research findings in psychology has been a topic of rising concern. Publication bias, or treating positive findings differently from negative findings, is a contributing factor to this "crisis of confidence," in that it likely inflates the number of false positive effects in the literature. We demonstrate a novel approach in which we postulate a set of plausible biasing processes, marginalize over this set, and obtain a mitigated effect size for an individual test or a series of test. The approach can be used to take into account the possibility of publication bias in one particular instance, but may also serve as a method for meta-analysis that accounts for the possibility of bias. Allowing for the possibility of publication bias leads to a more conservative interpretation of published studies as well as meta-analyses. We provide mathematical details of the method and example applications.

Symposium Abstracts

Is extra attention needed to remember feature bindings? Testing theoretically meaningful null hypotheses with Bayes factors

C. Morey[1]

[1]University of Edinburgh, Psychology, United Kingdom

Is general attention required to maintain combinations of visual features, over and above resources required to maintain visual features separately? Contradicting volleys of findings have been reported using similar experimental paradigms in which participants are given visual objects comprising one or two features to remember, with or without engaging in an unrelated secondary task. A statistically significant interaction indicating that the secondary task impairs memory for multi-feature objects more than memory for singlefeature objects constitutes evidence that general attention is especially needed for maintaining binding between features. Frustratingly, this interaction is occasionally but not consistently present, which leads to doubt about how best to describe the role of general attention in visual feature binding: is it necessary in select situations? Do individuals differ in the manner in which they approach a visual memory task? Or, do these differences in experimental outcome merely reflect noise in the inferential process? I will review experiments testing this hypothesis with similar methods and explain the benefits of consistently applying Bayesian statistics capable of meaningfully supporting null hypotheses.

Symposium Abstracts 10:20 – 10:40

From thinking in terms of effects (and failing to reject the null hypothesis) to thinking in terms of models (and embracing the invariance)

E. Vergauwe[1], J. Rouder[1]

[1]University of Missouri, Psychological Sciences, United States

For many decades, cognitive psychologists have been using the $p<.05$ rule for statistical inference. In this framework, the only way to provide strong support for Theory A is to demonstrate that a predicted effect occurs with the associated $p<.05$ result. To provide evidence against Theory A would be to demonstrate that a predicted affect does not occur. However, high p-values cannot be interpreted as evidence for an invariance (lack of an effect). Therefore, to provide strong evidence against Theory A is to come up with an effect that Theory A could not have predicted and show that it is associated with $p<.05$. That is, the way we do statistical inference has shaped the way we do research: it has become a (painful) hunt for significant effects. An alternative to p-values has been proposed: Bayes factors. Bayes factors describe the relative evidence from the data for one model relative to a competitor model. In common usage, one model is that there is an effect and the competitor is that there is an invariance. The Bayes factor can provide evidence for either, depending on the data, and with it, it is possible to state evidence for invariances. We thus now have a tool to provide strong support for and against Theory A as dictated by the data. I will discuss (1) How I switched from p-values to Bayes factors (with ups and downs); (2) How consideration of Bayes factors changed my way of thinking about research in cognitive psychology (e.g., once-despised null effects can be strong invariances, if they are theoretically motivated); and (3) The day-to-day implications of this switch including that many $p<.05$ effects turn out to have small Bayes factors suggesting that the evidence is inconclusive.

Symposium   09:00 – 11:00 | Amoroza A

Implicit vs. explicit learning and consolidation

D. Nemeth[1], A. Cleeremans[2], G. Albouy[3], K. Rauss[4], J. Born[3]

[1]Eotvos Lorand University, Institute of Psychology, Hungary
[2]Universite Libre de Bruxelles, Center for Research in Cognition & Neurosciences, Belgium
[3]KU Leuven University, Movement Control and Neuroplasticity Research Group, Belgium
[4]University of Tuebingen, Institute of Medical Psychology and Behavioral Neurobiology, Germany

The symposium will provide a state-of-the-art overview of theoretical and empirical developments on the neurocognition of implicit and explicit processes in procedural learning. The symposium will cover a range of experimental methods to examine implicit and explicit processes in learning and memory tasks. In everyday life, procedural learning is crucial for adapting to complex environments, aiding the organism in anticipating state changes and optimizing decisions in an efficient manner. A particular focus will be on methods and analytic techniques that dissociate implicit and explicit processes within procedural learning, and how these different systems might interact. Moreover, this kind of learning does not occur only during practice, in the so-called online periods, but also between practice periods, in the so-called offline periods. The process that occurs during the offline periods is referred to as consolidation, denoting the stabilization of a memory trace after the initial acquisition. Offline procedural learning can result in increased resistance to interference or even improvement in performance following an offline period. Understanding the multiple aspects and influencing factors of learning and consolidation can help us reveal the neurocognition of conscious and non-conscious processes and the underlying cooperative and competitive brain networks.

Symposium Abstracts

09:00 – 09:20

Competitive brain networks underlying implicit and explicit learning

D. Nemeth[1, 2], K. Janacsek[1, 2]

[1]Eötvös Loránd University, Budapest, Department of Clinical Psychology and Addiction, Institute of Psychology, Hungary
[2]Hungarian Academy of Sciences, Budapest, MTA-ELTE NAP B Brain, Memory and Language Lab, Institute of Cognitive Neuroscience and Psychology, Research Centre for Natural Sciences, Hungary

Human learning depends on multiple cognitive systems related to dissociable brain structures. These systems interact not only in cooperative but sometimes competitive ways in optimizing performance. Previous studies showed that manipulations reducing the engagement of frontal lobe-mediated explicit, attentional processes can lead to improved performance in striatum-related procedural learning. Here we present two studies in which we investigated the competitive relationship between sequence learning and frontal lobe-mediated executive functions. In Study 1, hypnosis was used as a tool to reduce the competition between these systems. We compared learning in hypnosis and in alert state and found that hypnosis boosted learning measured by a probabilistic sequence learning task. In Study 2, we explored the nature of such a relationship by investigating the effect of long term regular alcohol intake on sequence learning. Typically alcohol dependency impairs executive functions. Here we found weaker executive functions but intact sequence learning in the alcohol dependent group compared to the controls. Moreover, we found negative correlation between these functions in both groups. Our result shed light not only on the competitive nature of brain systems in cognitive processes, but also could have important implications for developing new methods to improve human learning.

Symposium Abstracts

09:20 – 09:40

Sleep consolidates the hippocampal-dependent representation of motor sequences

G. Albouy[1]

[1]KU Leuven, Kinesiology, Belgium

While several models of sleep-related memory consolidation have previously associated hippocampal activity with declarative memory, there is now increasing evidence that the hippocampus also plays a crucial role in procedural memory. In this presentation, I will review recent human functional neuroimaging studies demonstrating that the hippocampus is involved in the acquisition and sleep-related consolidation of procedural memories, and motor sequence-based skills in particular. More specifically, I will present evidence that hippocampal activity and its functional interactions with other brain structures, particularly competition with the striatum, contribute to the initial learning of sequential motor behavior. Interestingly, these early cerebral representations in the hippocampus and striatum, can predict subsequent sleep-related memory consolidation processes. I will also argue that sleep can reorganize the activity within, as well as the functional interactions between, these structures, ultimately favoring overnight performance enhancement. Furthermore, I will present a recent study that offers new insights into the respective roles of these structures in procedural memory consolidation processes. The results suggest that, in the context of motor sequence memory consolidation, the hippocampal system triggers subsequent sleep-dependent performance enhancement whereas the striatal system is involved in the maintenance of the motor behavior over time. Finally, I will conclude by presenting a new model, developed in collaboration with colleagues, that integrates the recent findings on the contribution of the hippocampal system in sleep-related motor sequence memory consolidation processes.

Symposium Abstracts

From implicit to explicit learning, and back

A. Cleeremans[1]

[1]Universite Libre de Bruxelles, Center for Research in Cognition & Neurosciences, Belgium

A great conceptual pendulum oscillates, with a period of about 30 or 40 years, over our understanding of the relationships between conscious and unconscious information processing. Its path delineates the contours of the unconscious mind as well as its contents: Sometimes smart and defining the very fabric of the mind, the unconscious is at other times relegated to taking care of little more than our bodily functions. At this point in time, the pendulum finds itself hovering rather steadily on the side of those who think so many functions are served by the unconscious that they even question the very role that consciousness plays in shaping the human mind. Here I will suggest that the pendulum has swung a little too far, and illustrate the argument with recent experimental findings that document how challenging it may be to arrive at a satisfactory conception of the relationships between conscious and unconscious information processing. I will focus on three recent studies — one dedicated to perceptual awareness and the other two dedicated to social cognition. All are suggestive that the specific methods we use, as well as the manner in which we interpret the data, are of profound importance with respect to the conclusions we draw about the power of the unconscious. A few general principles emerge from this skeptical analysis. First, the unconscious is probably overrated today. Second, there is a pervasive and continuing confusion between information processing without awareness and information processing without attention. I suggest that considering how learning and plasticity mechanisms modify conscious contents can reduce this confusion.

Symposium Abstracts

10:00 – 10:20

Consolidation and generalization of implicit sequence learning during sleep

K. Rauss[1], N. Lutz[1], S. Diekelmann[1], J. Born[1]

[1]University of Tuebingen, Institute of Medical Psychology, Germany

It is well established that sleep promotes consolidation of sequence knowledge. However, effect sizes vary depending on the nature of the sequences being learned (perceptual vs. motor), the type of association between sequence items (deterministic vs. probabilistic), and subjects' conscious knowledge during learning   (implicit vs. instructed-explicit vs. spontaneous-explicit). In this talk, I will outline studies from our group that have tested the contribution of sleep across these domains. Going beyond previous findings, our results indidate that the nature of sleep benefits in sequence learning changes during individual development. Furthermore, abstraction appears as a common denominator of sleep's role in consolidating sequence knowledge. Against this background, I will present data from an ongoing project that specifically investigates abstraction of sequence knowledge and how it depends on sleep.

Symposium Abstracts

10:00 – 10:20

Symposium

09:00 – 11:00 | Amoroza B - C

Neurocognitive correlates of cognitive control

L. Colzato[1], L. Steenbergen[2], C. Beste[3], A. Stock[2], B. Jongkees[1], F. Verbruggen[4]

[1]Leiden University, Psychology, Netherlands
[2]Leiden University, Cognitive Psychology, Netherlands
[3]Faculty of Medicine of the TU Dresden, Department of Child and Adolescent Psychiatry, Germany
[4]University of Exeter, Department of Psychology, United Kingdom

Frontal lobe circuits have a crucial role in the cognitive control of our thoughts and goal-directed behaviour. At least three control functions can be distinguished: "shifting" (also called "flexibility") between tasks and mental sets; "updating" (and monitoring of) working memory (WM) representations and the "inhibition" of prepotent responses. Apart from being empirically separable, they also seem to rely on different cortical structures and neuromodulatory systems. To give a complete overview of this complex phenomenon, this symposium will be interdisciplinary. Cognitive control will be presented from different perspectives and using different methodologies, behavioral, pharmacological, clinical, genetic, brain stimulation and brain-imaging studies.

Symposium

09:00 – 11:00 | Amoroza B - C

Symposium Abstracts

Tyrosine but not propranolol modulates cognitive flexibility: evidence from task-switching paradigm in randomized controlled trials

L. Colzato[1], L. Steenbergen[2], R. Sellaro[3], B. Hommel[1]

[1]Leiden University, Psychology, Netherlands
[2]Leiden University, Cognitive Psychology, Netherlands
[3]Leiden University, Cognitive Psychology Unit, Netherlands

There is evidence that both dopamine (DA) and noradrenaline (NE) are involved in different forms of cognitive flexibility. In two separate double-blind, randomized, placebo-controlled studies, we tested whether the administration of synthetic tyrosine (TYR) (Study 1), precursor of DA, and propranolol (a β1 and β2 adrenergic receptor antagonist) (Study 2), modulates cognitive flexibility as indexed by a task-switching paradigm. Compared to a neutral placebo, TYR promoted cognitive flexibility (i.e. reduced switching costs). In contrast, the acute administration of propranolol, corroborated by Bayesian inference, did not affect the size of switching costs. These findings support the idea that TYR (via increasing DA level), but not propranolol (via decreasing NE level) , modulates cognitive flexibility.

Symposium Abstracts

Dopaminergic modulation of working memory updating through transcranial direct current stimulation

B. Jongkees[1], R. Sellaro[2], B. Hommel[2], S. Kuhn[3], L. Colzato[4]

[1]Leiden University, Cognitive Psychology, Netherlands
[2]Leiden University, Cognitive Psychology Unit, Netherlands
[3]Center for Lifespan Psychology, Max Planck Institute for Human Development, Germany
[4]Leiden University, Psychology, Netherlands

The updating and monitoring of working memory (WM) representations is a key cognitive-control function. Dopamine (DA) has repeatedly been demonstrated to modulate this executive process. A better understanding of dopaminergic neuroplasticity modulation is crucial for understanding WM processes in humans. To study dopaminergic neuroplasticity, we applied transcranial direct current stimulation (tDCS), which is known to induce cortical excitability changes in humans. Anodal tDCS increases excitability, while cathodal Tdcs decreases it. Specifically, the aim of this study was to determine whether pharmacologically induced modulation of dopamine receptor activity, by administering the DA-precursor tyrosine, influences tDCS generated changes in excitability in the human dorsolateral prefrontal cortex, which plays a key role in implementing WM updating.

Symposium Abstracts

γ-Aminobutyric acid (GABA) improves action selection processes: evidence from transcutaneous vagus nerve stimulation (tVNS) and synthetic GABA administration

L. Steenbergen[1], R. Sellaro[2], A. Stock[3], C. Beste[4], L. Colzato[5]

[1]Leiden University, Cognitive Psychology, Netherlands
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[3]Faculty of Medicine of the TU Dresden, Cognitive Neurophysiology, Department of Child and Adolescent Psychiatry, Germany
[4]Faculty of Medicine of the TU Dresden, Neurophysiology, Department of Child and Adolescent Psychiatry, Germany
[5]Leiden University, Psychology, Netherlands

The ever-changing environment we are living in requires us to apply different action control strategies in order to fulfill a task goal. When confronted with multiple response options it is fundamental to prioritize and cascade different actions. So far, very little is known about the neuromodulation of action cascading. In this talk, I will present two studies. In the first study, we applied transcutaneous vagus nerve stimulation (tVNS), a new noninvasive and safe method to stimulate the vagus nerve and to increase GABA and NE concentrations in the brain. Results showed that active, as compared to sham stimulation, increased response selection functions during action cascading and lead to faster responses when two actions were executed in succession. In the second study, we assessed the specific causal role of the GABA-ergic system in modulating the efficiency of action cascading by administering 800 mg of synthetic GABA or 800 mg oral of microcrystalline cellulose (placebo). Results showed that the GABA group, compared to placebo group, increased action selection when an interruption (stopping) and a change toward an alternative response were required simultaneously. These findings provide the first evidence for a causal role of the GABA-ergic system in modulating performance in action cascading.

Symposium Abstracts   10:00 – 10:20

Neurobiochemical factors of goal activation during multitasking

A. Stock[1], C. Beste[2]

[1]Faculty of Medicine of the TU Dresden, Cognitive Neurophysiology, Department of Child and Adolescent Psychiatry, Germany
[2]Faculty of Medicine and Institute of Psychology, TU Dresden, Cognitive Neurophysiology, Germany

Several neurotransmitter systems have been shown to play a role in action selection, but little is known about what systems are of importance for action cascading (multitasking) processes. In this talk, we present evidence from neurophysiological studies examining different modulator of dopaminergic neurotransmission. The data show that dopamine D1 and D2 receptor systems play dissociable roles in implementing a specific strategy used during action cascading. Moreover, different modulators of the dopaminergic system could be shown to affect the strategies used during action cascading. These other modulators are related to neurotrophic factors, as well as the effects of acute high-level alcohol consumption (binge drinking), the effects of acute psycho-social stress and latent infectious diseases affecting specific elements in dopamine synthesis. These different lines of evidence suggest that different factors modulating dopaminergic activity are important to consider when trying to understand inter-individual differences of goal activation modes during action cascading and multitasking.

Symposium Abstracts   10:00 – 10:20

Symposium Abstracts

Functional neuroanatomy of goal activation during multitasking

C. Beste[1]

[1]Faculty of Medicine and Institute of Psychology, TU Dresden, Cognitive Neurophysiology, Germany

The examination of neuronal mechanisms underlying action selection are central to cognitive neuroscience research. However, most research conducted focusses on the functional neuroanatomy underlying execution of single actions, but not a cascade of different actions. This talk will provide an overview of the functional neuroanatomy underlying goal activation processes during action cascading and multitasking, based on neurophysiological (EEG) and functional imaging data. The data shows how the functional neuroanatomy of action selection processes during multi-component behavior is affected by variations of stimulus-response mapping processes. In line with the functional imaging data, results from genetic determined diseases suggest that the striatum and especially striatal medium spiny neurons strongly determine the strategy used during action cascading. Adding on these results, GABA-edited magnetic resonance spectroscopy data further orroborates the role of the striatal GABAergic system in implementing the strategy used during action cascading and multitasking. However, within the functional neuroanatomy related to the implementation of different strategies during action cascading the right inferior frontal gyrus (rIFG) and the subthalamic nucleus seem to play special roles. Data shows that it is possible to bi-directionally shift the efficacy of action cascading processes by stimulating the rIFG using transcranial magnetic stimulation, or by modulating firing patterns in the subthalamic nucleus by means of therapeutic deep brain stimulation.

Symposium Abstracts　　　　　10:40 – 11:00

Action control in response-inhibition tasks: A biased competition account

F. Verbruggen[1]

[1]University of Exeter, Psychology, United Kingdom

Flexible behaviour relies on a control system that suppresses action plans in response to changes in the environment. To date, most studies of executive action control and response inhibition have focused on what is controlled, but not on how control is exercised. I propose that stopping relies on three cognitive mechanisms: detection of the stop signal, selection of the alternative response, and its execution. These mechanisms are modulated by 'preparatory' or 'proactive' control processes. I will present a series of recent studies from our lab that highlight the importance of stimulus detection for response inhibition. Furthermore, I will show that proactive stopping involves finding a balance between ignoring irrelevant information in the environment and monitoring for the occurrence of occasional stop signals. Finally, I will argue that 'biased competition' occurs at different processing stages in various versions of the stop-signal task.

Symposium Abstracts　　　　　10:40 – 11:00

Symposium

Social and emotional information processing in the developing Brain

J. Bertels[1], A. Destrebecqz[1], A. de Heering[2], M. Peltola[3], O. Godard[4], J. Baudouin[5]

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[2]Universite Catholique de Louvain, Face Categorization Lab, Belgium
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This symposium will shed light on how infants process their social and emotional environment. To do so, we will examine infants' processing of information of different nature such as pictures, odors and actions, varying in their degree of social and emotional content. Specifically, Adelaide de Heering (UCL, Belgium) will show how 4- to 6-month-old infants categorize socially relevant stimuli such as faces despite they considerably vary in size, viewpoint, illumination, expression, age and gender. Moreover, she will provide evidence that infants' neural response to faces is restricted to the right hemisphere already at that age. Then, Mikko Peltola (University of Tampere, Finland) will illustrate that 7-month-old infants' sensitivity to social cues signaling threat (fearful facial expressions, in particular) is associated with infant-mother attachment formation later in life. Julie Bertels (ULB, Belgium) will illustrate that detection of evolutionary threat-relevant non-social stimuli such as snakes elicits a broadening of spatial attention in 6- to 12-month-old infants, although they have no experience with these animals. Jean-Yves Baudouin (Universite de Bourgogne, France) will pursue the symposium by presenting a series of studies focusing on the development of eye movement between 3 and 12 months of age when emotional stimuli are involved. Ornella Godard (Universite Paris Descartes, France) will then report recent findings on affective matching of odors and expressive faces in 3- 5- and 7-month-old infants. As in the previous talk, the role of multisensory processing (olfaction-vision) will be discussed. Finally, Arnaud Destrebecqz (ULB, Belgium) will show that 13-month-olds are already able to infer another person's intentions manifested through a goal-directed action, and describe how this ability influences infants' looking behaviour. Overall, these findings not only illustrate infants' social and emotional capabilities early in life but also how they impact, in turn, their social and emotional environment.

Symposium Abstracts

Rapid Categorization of Natural face images in the infant right hemisphere

A. de Heering[1], B. Rossion[1]

[1]Universite Catholique de Louvain, Belgium, Belgium

Human performance at categorizing natural visual images surpasses sophisticated automatic algorithms, but how and when this function arises and develops remain unanswered. We recorded scalp electrical brain activity in 4-6 months infants viewing images of various objects in their natural background at a rapid rate of 6 images/second (6 Hz). Widely variable natural face images appearing every 5 stimuli generated an electrophysiological response over the right hemisphere exactly at 1.2 Hz (6 Hz/5). This face-selective response was absent for phase-scrambled images, showing that it is not due to low-level visual information. These findings indicate that right lateralized face-selective processes emerge well before reading acquisition in the infant brain, who is able to perform figure-ground segregation and generalize face-selective responses across faces varying in size, viewpoint, illumination as well as expression, age and gender. They open an avenue for clarifying the developmental course of natural image categorization and identity discrimination in the human brain.

Symposium Abstracts

09:20 – 09:40

Spatial attentional biases to threat-relevant stimuli in infancy

J. Bertels[1], C. Bayard[2], A. Destrebecqz[3]

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Many studies support the existence of a general bias for the detection of threat in humans. In particular, capture of attentional resources by threat-related stimuli has been reported in adults but also in infants, who most probably have no or limited experience with these stimuli. However, these studies do not inform us about how the detection of such stimuli in the visual space influences the spatial orienting of attention. Still, spotting of a threatening item in the environment should automatically activate information about its spatial location in order to elicit a proper reaction, given the localization of threat. To address this question, we used an emotional version of the spatial cuing paradigm, adapted to 6- to 12- month-olds. Peripheral cues consisted in pictures of threat-relevant and threat-irrelevant stimuli (snakes and flowers, respectively), and were followed by the presentation of a bilateral target. Direction and latency of the first saccade once the target is presented was recorded on each trial. Preliminary results revealed that infants' first saccade was more often oriented to the cued than to the uncued target when the cue was threat-irrelevant. However, when the cue was threat-relevant, infants oriented as much to the cued as to the uncued target. Most probably, detection in the visual attentional space of the curvilinear shape of the snake induced a broadening of attention, so that infants were vigilant to both sides of space. Another possibility is that threat-relevant stimuli triggered an avoidance reaction, so that infants oriented more to the uncued target when a snake than when a flower was presented. Ongoing analyses of the infants' saccades latencies towards the cue and the target will help us disentangle these possibilities.

Symposium Abstracts

How infants deploy their visual attention to emotionally-expressive faces: An eye-tracking approach

J. Baudouin[1, 2], N. Dollion[2], O. Godard[3], K. Durand[3], R. Soussignan[3, 4], B. Schaal[4]

[1]Universite de Bourgogne-Franche-Comte, Developmental ethology and cognitive psychology group, Centre for Smell, Taste and Food Science, UMR 6265 CNRS – UMR 1324 INRA, France
[2]Institut Universitaire de France, Paris, France
[3]Universite Paris Descartes, Institut de Psychologie, France
[4]Universite de Reims Champagne-Ardenne, Reims, France

The present studies aimed to explore whether the visual attention of infants is differently attracted by the facialaction units used by adults to communicate their emotional feelings. In study 1, 8-month-old infants (N=30) were familiarized with the photograph of an expressively-neutral female face, and then presented with the same female's face expressing basic emotions (happiness, anger, disgust, fear, sadness, or neutrality). The results indicated that 8-month-old infants paid attention to different facial areas according to the emotions expressed by the faces. We concluded that from at least 8 months of age, infants differentially explore faces as a function of the expressed emotions. In study 2, we investigated the development in 3- (N=36), 7- (N=66), and 12-(N=59) month-old infants presented with dynamic faces expressing various emotions. The results indicated that the pattern of exploration evolved from an exploration of external features and eyes for most expressions at 3 months, to the exploration of various internal facial features (e.g., nose, mouth), which differentiated the different expressions at 7 and 12 months. In Study 3, we investigated further the way adults (N=30) explored dynamic expressive faces to compare their patterns with infants patterns. The results indicated that the adults' patterns were similar to 7- to 12-month-old infants, with some differences, however. Looking at the exploration patterns further suggested that the way an expression was explored was associated with the emotion that was (wrongly) seen. Finally, we will briefly present a set of studies in which we used previous data to investigate the role of olfaction in the development of facial emotion understanding in infancy. The implications for the study of the development of facial emotion understanding in infancy in a multisensory processing (olfaction-vision) framework will be discussed.

Symposium Abstracts

Affective matching of odors and facial expressions in infants: Shifting patterns between 3 and 7 months

O. Godard[1], K. Durand[1], B. Schaal[1], J. Baudouin[1]

[1]Universite de Bourgogne, Centre des Sciences du Gout et de l'Alimentation, France

Recognition of emotional facial expressions is a crucial skill for adaptive behavior. Past research suggests that at 5 to 7 months of age, infants look longer to an unfamiliar dynamic angry/happy face which emotionally matches a vocal expression. This suggests that they can match stimulations of distinct modalities on their emotional content. In the present study, olfaction–vision matching abilities were assessed across different age groups (3, 5 and 7 months) using dynamic expressive faces (happy vs. disgusted) and distinct hedonic odor contexts (pleasant, unpleasant and control) in a visual-preference paradigm. At all ages the infants were biased toward the disgust faces. This visual bias reversed into a bias for smiling faces in the context of the pleasant odor context in the 3-month-old infants. In infants aged 5 and 7 months, no effect of the odor context appeared in the present conditions. This study highlights the role of the olfactory context in the modulation of visual behavior toward expressive faces in infants. The influence of olfaction took the form of a contingency effect in 3-month-old infants, but later evolved to vanish or to take another form that could not be evidenced in the present study. Several hypotheses are proposed on how such olfacto-visual intersensory abilities can come to be specified so early.

Symposium Abstracts

Symposium Abstracts

The difference between deliberate and accidental consequences of actions in children and chimpanzees

A. Destrebecqz[1], L. Legrain1, W. Gevers[2]

[1]ULB, CO3/CRCN, Belgium [2]ULB, ABC/CRCN, Belgium

We address the question of the nature of the information needed by 13-month-old infants to understand another agent's intentions. In two experiments, an experimenter was either unable or unwilling to give a toy to an infant. Importantly, an implement (a gutter in which the toy could roll down toward the infant) was used to make the experimenter's behavior as similar as possible in the two conditions. When the experimenter remained still in both conditions, infants did not behave differently according to the experimenter's intentions, suggesting that they did not infer them. By contrast, in a second experiment, where the experimenter performed an action directed toward the gutter in both conditions, the infants looked away from the experimental setting more often and longer in the unwilling condition than in the unable condition. They also looked more toward the experimenter in the unable condition than in the unwilling condition. These results support that an agent's intentional attitude can already be inferred by a 13-month-old provided that this intention is concretely shown through a goal-directed action. 19 chimpanzees were tested in a similar situation. Results indicate that chimpanzees adapted their vocalizations to the intentional state of their partner. Interestingly, this was only the case for those who recognized themselves in a mirror. These results support the notion of a relationship between self-awareness and intention attribution.

Symposium Abstracts

Antecedents of attachment security in infancy: Attention and neural responses to negative emotions

M. Peltola[1], L. Forssman[2], S. Yrttiaho1, K. Puura[3], M. van IJzendoorn[4], J. Leppänen[1]

[1]University of Tampere, School of Social Sciences and Humanities/Psychology, Finland
[2]University of Tampere, School of Medicine, Finland
[3]Tampere University Hospital, Department of Child Psychiatry, Finland
[4]Leiden University, Centre for Child and Family Studies, Netherlands

One of the key functions of attachment relationships is to shape the way individuals perceive and respond to potential threats. From this perspective, developmentally early markers of later attachment security vs. insecurity may be detected in infants' responses to social cues signaling threat. Utilizing established paradigms from developmental emotion research, we measured attentional biases and neural responses to emotional faces in 7-month-old infants and particularly investigated whether early sensitivity to fearful vs. nonfearful faces is related to attachment security to the caregiver at 14 months of age. Infants (N = 73) were tested at 7 months with an eye-tracking paradigm assessing attention disengagement from faces (neutral, happy, fearful) and control stimuli towards peripheral distractors. Event-related brain potentials (ERPs), indexing cortical differentiation of facial expression stimuli, were simultaneously recorded with high-density EEG. Fear bias scores were computed, reflecting differences in a) the probability of disengaging attention from fearful vs. non-fearful faces and b) posterior ERP responses (N290 and P400 components) to fearful vs. non-fearful faces. Infant-mother attachment was assessed with an observational paradigm (Strange Situation Procedure) at 14 months, with 46 infants classified as securely and 27 infants as insecurely attached to their mother. In the eye-tracking paradigm, attention to fearful faces at 7 months predicted attachment security to the mother at 14 months, with a smaller attentional bias to fearful expressions associated with insecure attachment. The ERP data complemented the attentional bias data in showing reduced cortical differentiation of fearful and nonfearful expressions in insecurely attached infants. Exploratory analyses indicated that an absence of an agetypical fear bias in both measures (eye-tracking and ERP) was almost exclusively associated with insecure attachment. Together, these data provide the first evidence linking infants' sensitivity to social cues signaling threat (reflected in attentional biases and cortical encoding) with attachment formation to the caregiver.

Oral Presentation

A dimensional approach to developmental impairments of attention, learning and memory

S. Gathercole[1, 2], F. Woolgar[3], D. Astle[3], T. Manly[3], J. Holmes[4]

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[4]Medical Research Council, Cognition & Brain Sciences Unit, Cambridge, United Kingdom

The aim of this study was to identify cognitive dimensions underlying specific learning difficulties that are associated with high degrees of comorbidity, such as attentional problems, reading and maths difficulties, and language impairments. Data were analysed from 100 children referred by education and health practitioners to a research clinic on the basis of problems in attention, learning (to include language and academic attainment) and/ or memory. The key measures were of phonological processing, verbal memory, and nonverbal reasoning and working memory. The most common learning profiles were impairments of i) language, reading and maths, ii) reading and maths, and iii) maths only. Dimensional analyses identified two correlated learning factors - general learning ability and maths - and two cognitive dimensions - verbal and visuo-spatial. The verbal dimension accounted for 55% of variance in general learning. The best single predictor of this ability was delayed story recall, accounting for 47% of the variance. The maths factor was highly linked with both the verbal and visuo-spatial factors dimensions. These findings indicate that typical comorbid profiles of 'specific' learning difficulties can be decomposed into two dimensions. The first dimension reflects general learning problems spanning language, reading and maths, and these are linked with verbal abilities that extend across phonological processing, working memory and episodic long-term memory. A second dimension related to learning difficulties in maths is additionally linked with visuo-spatial skills, particularly in working memory.

Oral Presentation

Is storage capacity or attentional control the end story to nderstanding VSTM in childhood? Going beyond the investigation of single mechanisms

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Visual short-term memory (VSTM) is limited in capacity, and differentially so over the lifespan. Recent findings have shown that differences in the ability to use top-down attention to enhance maintenance are important for understanding developmental improvements in VSTM (Shimi, Nobre, Astle, & Scerif, 2014, Child Dev.). Yet, we hypothesized that changes in the ability to orient attention to internally held representations are not the end point to understanding developmental differences in VSTM performance. In a series of complementary experiments, we explored whether additional factors that have previously been suggested (in isolation) to constrain VSTM in children, i.e., decay and load, interact with attentional control during maintenance and limit 7-year-olds' VSTM capacity even more. Results showed that 7-year-olds apply top-down biases when they are required to maintain a higher memory load in VSTM, however, these biases are constrained by time. These results suggest that in addition to storage capacity and attentional control limits, memory load and time constrain 7-year-olds' VSTM further. These findings advance our knowledge about the mechanisms driving improvements in VSTM performance.

Oral Presentation

Does rehearsal help immediate serial recall?

K. Oberauer[1], A. Souza[2]

[1]University of Zurich, Psychology, Switzerland
[2]University of Zurich, Depto. Psychology, Switzerland

The assumption that articulatory rehearsal is beneficial for immediate serial recall of verbal materials has been virtually taken for granted. Yet, there is no experimental evidence supporting a beneficial causal effect of rehearsal on immediate serial recall. We present an experiment that manipulates the frequency and the schedule of rehearsal. Participants were instructed to remember a list of words in serial order and engage in cumulative rehearsal. They were instructed to rehearse overtly to monitor their rehearsal behavior. The instruction increased the prevalence of cumulative rehearsal in comparison to a control condition in which participants were free to rehearse as they wished. Instructed cumulative rehearsal led to better recall of words from the beginning of the list at the expense of words at the end of the list. Nevertheless, participants did not recall more words overall in the instructed-rehearsal condition than in the control condition, showing that cumulative rehearsal does not improve performance in serial recall.

Oral Presentation

Oral Presentation

Questioning short-term memory and its measurement: Why digit span measures long-term associative learning

G. Jones[1], B. Macken[2]

[1]Nottingham Trent University, Psychology, United Kingdom
[2]Cardiff University, Psychology, United Kingdom

Traditional accounts of verbal short-term memory explain differences in performance for different types of verbal material by reference to inherent characteristics of the verbal items making up memory sequences. The role of previous experience with sequences of different types is ostensibly controlled for either by deliberate exclusion or by presenting multiple trials constructed from different random permutations. We cast doubt on this general approach in a detailed analysis of the basis for the robust finding that short-term memory for digit sequences is superior to that for other sequences of verbal material. Specifically, we show across four experiments that this advantage is not due to inherent characteristics of digits as verbal items, nor are individual digits within sequences better remembered than other types of individual verbal items. Rather, the advantage for digit sequences stems from the increased frequency, compared to other verbal material, with which digits appear in random sequences in natural language, and furthermore, relatively frequent digit sequences support better short-term serial recall than less frequent ones. We also provide corpus-based computational support for the argument that performance in a short-term memory setting is a function of basic associative learning processes operating on the linguistic experience of the rememberer. The experimental and computational results raise questions not only about the role played by measurement of digit span in cognition generally, but also about the way in which long-term memory processes impact on short-term memory functioning.

Oral Presentation

12:50 - 13:10 | Akamas A

Visuospatial bootstrapping effects in working memory

R. Allen[1], J. Havelka[1], C. Calia[2], S. Darling[1]

[1]University of Leeds, School of Psychology, United Kingdom
[2]Queen Margaret University, Division of Psychology and Sociology, United Kingdom

It has recently been demonstrated that immediate memory for digits is superior when items are presented in a meaningful 'keypad' spatial configuration. This phenomenon, termed 'visuospatial bootstrapping', involves the integration of verbal and spatial information in working memory via stored knowledge in long-term memory. We have recently explored the basis of this effect experimentally using dual-task manipulations, with outcomes indicating contributions to verbal-spatial binding from spatial working memory and modality-general storage (possibly within the episodic buffer). We have also examined the extent to which the effect emerges in different population groups, including children of different ages, healthy older adults, and individuals with mild cognitive impairment. An overview of this recent work will be provided, along with a consideration of current and future directions.

Oral Presentation

Incorrect predictions reduce switch costs

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In three experiments, we combined two sources of conflict within a modified task-switching procedure. The first source of conflict is the one inherent in any task switching situation, namely the conflict between a task set activated by the recent performance of another task and the task set needed to perform the actually relevant task. The second source of conflict was induced by requiring participants to guess aspects of the upcoming task (Exp. 1 & 2: task identity; Exp. 3: position of task precue). In case of an incorrect guess, a conflict accrues between the representation of the guessed task and the actually relevant task. While incorrect guesses led to an overall increase of reaction times and error rates, they reduced task switch costs compared to conditions in which participants predicted the correct task. We interpret these findings in terms of an enhanced level of controlled processing induced by a combination of two sources of conflict converging upon the same target of cognitive control.

Oral Presentation

Tactile stimuli increase effects of modality compatibility in task switching

D.N. Stephan[1], I. Koch[2]

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[2]RWTH Aachen University, Psychology I, Germany

Modality compatibility refers to the similarity of stimulus modality and modality of response-related sensory consequences (e.g., vocal response effects are audible). Previous dual task studies found increased switch costs for modality incompatible tasks (auditory-manual and visual-vocal) compared to modality compatible tasks (auditory-vocal and visual-manual). The present task switching study examined modality compatibility and investigated vibrotactile stimulation as a novel alternative to visual stimulation. Interestingly, a stronger effect of modality compatibility on switch costs was revealed for the group with tactile and auditory stimulation compared to the group involving visual and auditory stimulation. We suggest that the modality compatibility effect is based on cross-talk of central processing codes due to ideomotor "backward" linkages between the anticipated response effects and the stimuli indicating this response. Due to a higher degree of compatibility in the tactile-manual tasks, crosstalk is increased the group with tactile-auditory stimulation compared to the group with visual-auditory stimulation.

Oral Presentation

Oral Presentation

Time-based expectancy for task relevant stimulus features and feature Combinations

R. Thomaschke[1], J. Hoffmann[2,3], C. Haering[1], A. Kiesel[3]

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[2]Julius-Maximilians-Universitat Wurzburg, Psychology, Germany
[3]Liverpool Hope University, Psychology, United Kingdom

When a particular target stimulus appears more frequently after a certain interval than after another one, participants adapt to such regularity, as evidenced by faster responses to frequent interval-target combinations than to infrequent ones. This phenomenon is known as time-based expectancy. Previous research has suggested that time-based expectancy is primarily motor-based, in the sense that participants learn to expect a particular response requirement after a specific interval. We conducted a Two-Alternative-Forced-Choice experiment with four stimuli differing in shape and orientation, in order to determine whether time-based expectancy can also impact on perceptual processing. Only a subset of the stimuli was frequently paired with a certain interval, while the other subset was uncorrelated with interval. We varied the response relevance of the interval-correlated stimuli, and investigated under which conditions time-based expectancy transfers from trials with interval-correlated stimuli to trials with interval-uncorrelated stimuli. The results indicate that participants formed time-based expectancy for response-relevant stimulus features only.

Oral Presentation

12:30 - 12:50 | Akamas B

A brain network involved in domain-general task-switching

A. Vallesi[1, 2], S. Arbula[2], M. Capizzi[2]

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[2]University of Padova, Centro di Neuroscienze Cognitive, Italy

The ability to shift between different task rules, which underlies cognitive flexibility, has been classically associated to the functionality of left fronto-parietal regions. Moreover, the left and right hemispheres have been traditionally linked with processing of verbal and spatial material, respectively. The present study investigated with functional Magnetic Resonance Imaging (fMRI) whether the processes engaged during taskswitching interact in the brain with the material of the tasks to be switched, that is, verbal or spatial. Importantly, physical stimuli were exactly the same and participants' performance was matched between the two domains. The fMRI results showed a clearly left-lateralized involvement of fronto-parietal regions when contrasting task-switching vs. single task blocks in the context of verbal rules. A more bilateral pattern, especially in the prefrontal cortex, was instead observed for switching between spatial tasks. Moreover, while a conjunction analysis showed that the core regions involved in task-switching, independently of the switching context, were localized both in left inferior prefrontal and parietal cortices and in bilateral supplementary motor area, a more direct analysis of functional lateralization revealed that hemispheric asymmetries in the frontal lobes were more biased toward the left side for the verbal domain than for the spatial one and vice versa. Overall, these findings highlight the role of left fronto-parietal regions in task-switching, above and beyond the specific task requirements, but also show that hemispheric asymmetries may be modulated by the more specific nature of the tasks to be performed during task-switching. (Funding: ERC Starting Grant LEX-MEA, GA 313692).

Oral Presentation

12:50 - 13:10 | Akamas B

Joint Performance without Corepresentation

M. Yamaguchi[1], H. Wall[1]

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Cognitive performance depends not only on one's own intention to act toward a task goal but also on automatic tendencies to react to the environment. For instance, in the Simon task, participants are instructed to press left and right keys according to non-spatial aspects of stimuli (e.g., colors), but responses are faster if the locations of stimuli and responses correspond than when they do not. This advantage of spatial correspondence is known as the Simon effect and has been shown to be modulated by two factors, proportions of the corresponding and noncorresponding trials and the sequence of these trial types. These modulations are thought (at least partly) to reflect strategic control of automatic processes underlying response selection. The present study examined whether such strategic control of automatic processes is effected in a joint task setting. Participants pressed a key when stimuli appeared in the color assigned to that key but withheld pressing the key when they appeared in the other color. No Simon effect was obtained when they performed the task by themselves (i.e., one participant pressed one key and the other participant only watched the task), but the effect was obtained when participants performed the task with a partner (i.e., one participant pressed one key and the other participant pressed the other key). Importantly, the proportions of corresponding and noncorresponding trials modulated this joint Simon effect regardless of whether they were manipulated for themselves or only for their partners. The sequence of corresponding and noncorresponding trials also modulated the joint Simon effect, whereby the modulation was larger if the previous trial was performed by the partner than by participants themselves. These findings suggest that participants are sensitive to the task context of their partners. Whether these findings reflect social factors is discussed.

Oral Presentation

Unconscious emotional effects on syntactic processing during sentence comprehension: An ERP study

L. Jiménez Ortega[1, 2], J. Espuny[3], P. Herreros de Tejada[4, 5], C. Vargas-Rivero[1], M. Martin-Loeches[1, 6]

[1]Universidad Complutense de Madrid, Psychobiology, Spain
[2]Center UCM-ISCIII for Human Evolution and Behaviour, Cognitive Neuroscience Section, Spain
[3]Complutense University of Madrid, Center UCM-ISCIII for Human Evolution and Behaviour, Spain
[4]UCM-ISCIII, Center for Human Evolution and Behavior, Spain
[5]Complutense University of Madrid, Psychobiology Department, Spain
[6]Universidad Complutense de Madrid, Psychobiology Department, Spain

Contrary to classic views of syntactic processing, recent studies demonstrate that syntactic processing is affected by emotional information. It has also been demonstrated that emotional unconscious information can also affect cognitive processes at several levels. In everyday life experience, we often process emotional information without awareness; however there is a lack of studies investigating how unconscious emotional information may affect language comprehension. In the present experiment we investigate whether unconscious emotional information may impact syntactic processing. To this aim, subliminal adjectives of either positive, neutral or negative valence followed by a hash mask were inserted in neutral sentences just before the appearance of the supraliminal adjective, which might be either correct (50%) or contain a morphosyntactic violation (number or gender disagreement). Subliminal adjectives were correct with respect to the sentence. Behavioral data demonstrated that subliminal information affected decision taking in a sentential acceptability task; error rates for incorrect sentences were higher in comparison to correct ones. ERP data revealed that unconscious negative emotional adjectives triggered emotional components (LPC) similar to those observed for conscious emotional stimulation. Furthermore, emotional adjectives affected syntactic conscious processing of sentences containing syntactic anomalies. In this regard, a lack of the LAN component and an early P600 onset for the negative condition in comparison to neutral and positive ones was observed. In turn, positive masked adjectives prompted an earlier LAN component onset. The results are discussed in terms of priority of access and interference between emotional stimuli and combinatorial linguistic processes, with consequences for models of language comprehension.

Oral Presentation

11:50 – 12:10 | Akamas C

On the influence of the orthographic system beyond linguistic processes

S. Schlöffel[3], C. Martin[1, 2], M. Lallier[3], M. Carreiras[1, 3]

[1]BCBL, BCBL, Spain
[2]Ikerbasque, Ikerbasque, Spain
[3]BCBL, Predoc, Spain

It is widely acknowledged that the orthographic system of a language strongly influences linguistic processes. The relative consistency of phoneme-grapheme conversions, for instance, results in differences in reading strategies across languages, and even modulates speech perception. In the present study, we investigated whether the influence of phoneme-grapheme conversion rules can be extended beyond the linguistic domain to non-linguistic processes. We tested 83 adults (22.5 years-old) whose native languages differ in orthographic depth (Spanish, transparent and French, opaque) in a two-phase non-linguistic task. During the learning phase, participants were presented with tone-shape pairs, tones being either consistently paired with one shape (transparent rule) or with two different shapes (opaque rule). During both phases, the task required participants to focus on the tone they were hearing and press the corresponding button (shapes were task-irrelevant). Critically, during the test phase, trials were either congruent or incongruent with the tone-shape pairings acquired in the learning phase. Congruency effects (reaction times in incongruent versus congruent trials) were measured for transparent and opaque pairings. Because of the opacity of phoneme-grapheme conversion rules in their language, French participants were expected to show equally large congruency effects for transparent and opaque pairings (indicating the acceptance that one sound can be mapped onto two different shapes), while Spanish readers were expected to learn only the simple rule, in line with their reading experience (one-to-one correspondence of sounds and letters). Our results confirmed these hypotheses, showing that the orthographic depth of a language can indeed affect the way one processes non-linguistic stimuli. In order to extend the results to non-expert readers, we replicated the study in 54 French and Spanish children (7.5 years-old). The pattern of results was equivalent, revealing that the influence of the orthographic system extends to non-linguistic processes, even after only short exposure to such orthographic rules.

Oral Presentation

The influence of speaker accent on ambiguity resolution

J. Rodd[1], Z. Cai[1], G. Gaskell[2], M. Davis[3]

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[3]MRC Cognition and Brain Sciences Unit, MRC Cognition and Brain Sciences Unit, United Kingdom

Ambiguous words are ubiquitous in natural language: over 80% of common English words have multiple dictionary definitions. Listeners' knowledge about the relative frequencies of word meanings strongly influences how these words are interpreted, such that highly frequent meanings (e.g., pen: writing implement) are more readily available than lower frequency meanings (e.g., pen: animal enclosure). The current studies explore whether listeners keep track of different meaning preferences for particular groups of speakers, and use this information to guide interpretation in the absence of sentential context. We make use of the fact that the relative frequency of some word meanings is markedly different in British and American English (e.g., "fall", "gas"). In Experiment 1 we show that the probability that UK-based participants will retrieve the US-dominant meaning (e.g., gas: CAR) on a word association task is increased when they hear the words spoken in a US accent, compared with a UK accent. We then used an audio-morphing method to combine these US- and UKaccented words to create stimuli that were perceived as having no strong accent. We show that these accentneutral items are interpreted as if they were strongly accented when they are embedded within a context of more strongly accented stimuli (Experiment 2), but that a similar transfer effect does not occur for visually presented ambiguous words (Experiment 3). Taken together these findings show that listeners do not use the accent-related cues that are available in individual words to guide meaning access on a trial-by-trial basis, but instead they build up an accent identity of a speaker and that this accent context modulates meaning access for all words that are perceived as coming from that speaker. These results motivate an 'inferential' account of word comprehension in which listeners determine key characteristics of speaker and use this knowledge to guide meaning access.

Oral Presentation

The time-course of cross modal word learning in adults

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Although the acquisition of a novel spoken form is often rapid, previous research with adults suggests that integration of novel and existing knowledge requires a consolidation period associated with sleep (Dumay & Gaskell, 2007). The hallmark of integration is novel word (e.g., cathedruke) interference with an existing lexical item (e.g., cathedral) resulting in increased recognition latencies. It is now well established in the spoken modality that this delay is usually observed only after sleep, but an interesting question arises as to whether the timecourse remains the same when training occurs in one modality (e.g., spoken) and test in another (e.g., the printed form). Is a visual representation automatically generated when learning a spoken word form and vice versa? The present study used a lexical decision paradigm with adults (N=40) to investigate whether a) lexical competition effects emerge with the same timecourse in both uni-modal (speech-speech or print-print) and cross-modal conditions (speech-print or print-speech) and b) whether there is any advantage for learning in one modality over another. Preliminary data will be presented from this ongoing study. We did not replicate the previous observation (Bakker et al., 2014) that competition effects take longer to emerge in cross-model than uni-modal conditions. When training was visual, consolidation effects emerged for items trained before sleep,but not those that had been recently learned, but differences were no longer evident a week later suggesting that the newly learned representations may not have been robust. In contrast to previous results with spoken words, lexical competition effects were not present early on but emerged a week later. The findings suggest that competition may occur across modalities immediately. The discrepancies between our findings and those of Gaskell and colleagues for spoken word learning will be discussed in the light of differences in training regime.

Oral Presentation

Time, sleep and lexical ambiguity

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Semantically ambiguous words (e.g, bark) vary in the relative strengths of their meanings, presumably reflecting our history of encounters with the words in different contexts. Rodd et al. (2013) demonstrated that these biases are surprisingly malleable. Participants heard ambiguous words in sentence contexts that were congruent with their subordinate meanings. After 20 min the participants generated associates of the words. Responses related to the subordinate meanings were more common in this primed condition, compared with an unprimed baseline. Here, we used the same paradigm to assess the broader time-course of this effect. Experiment 1 manipulated time between exposure and association test (immediate, 20 min, 40 min). All time-points showed an influence of contextual priming, although the effect was stronger immediately after exposure than at the other two timepoints, which showed equivalent priming. Experiment 2 examined whether priming effects held after an interval incorporating wake or sleep. For half the participants the interval was 12 hours (AM-PM or PM-AM); for the remainder it was ~4 hours including either a polysomnographically recorded nap or a silent video to watch. One subset of items was used in the association test ~20 min after learning and the other was tested after the interval. Participants who slept showed equivalent priming at both time-points, whereas participants who stayed awake showed clear priming after 20 min but no priming later. For nap participants the later priming effect was correlated with time in REM sleep. These results suggest that modulations of meaning dominance can occur after one exposure, and that these shifts are evident at least 40 min later. More permanent updating of a word's lexical semantic representation may depend critically on the occurrence of (REM) sleep. We interpret these

Oral Presentation

Properties of retrieval-induced forgetting in motor memory

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Human memory is subject to continuous change. Beside the accumulation of contents as a consequence of encoding new information, the accessing of memory influences later accessibility. Retrieval can shape memory in opposing ways, by strengthening some and weakening other information. The phenomenon of retrievalinduced forgetting has been demonstrated for a variety of materials, mostly verbal material. Recent studies suggest that retrieval-induced forgetting also affects procedural memory (e.g. Tempel & Frings, 2013, 2014, 2015) in which motor behavior is represented. Several properties of retrieval-induced forgetting have been documented in previous studies. These properties have been linked to different theoretical model assuming an inhibitory mechanism, interference-based blocking, or an internal context change to cause retrieval-induced forgetting. We investigated which of those properties may also apply to motor memory. In our experiments, participants first learned sets of motor sequences in response to individual stimuli. An item set was defined by a common feature of the sequences, such as, the same effector used for movement execution or a common movement direction. After retrieval practice on a subset of sequences, a final test assessed memory for all items. We found retrieval-induced forgetting of motor action to be retrieval-specific, to be independent from strengthening of practiced items, and to occur with novel test cues. The latter finding in particular corresponds to the inhibitory postulate of cue independence and, furthermore, suggests that motor programs representing motor action in a format closely corresponding to movement execution were affected. Moreover, retrievalinduced forgetting depended on the categorized encoding of motor sequences according to principles specific for the organization of motor action in memory.

Oral Presentation

Effects of auditory distraction on memory and meta-memory: The case of Encoding

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Auditory distraction encountered at encoding robustly impairs later memory performance on a variety of recall and recognition tasks. The effects are particularly pernicious because, unlike visual distraction, auditory distractors cannot be avoided by simple perceptual means (e.g., gaze aversion, closing one's eyes). This does not, however, preclude the possibility that the negative effects of auditory distraction may be mitigated by exercising control over cognitive processes. The present study looked at one instance of control processes that may be used to compensate for the harmful effects of auditory distraction – increasing study time during a memory task. A series of experiments were designed to investigate whether participants exposed to auditory distraction extend study/encoding time to counter the distraction effect. Participants appeared aware of the disruptive effect of auditory distracter but, when presented with lists of words accompanied by auditory distraction, they not only failed to extend study to compensate for the harmful effects of distraction but actively curtailed study compared to lists of words presented in a quiet control condition. This pattern of curtailed study times emerged independently of whether participants were asked to study organized materials (lists of categorized words) or materials with less organization (uncategorized words) and was present in free, serial and cued recall tests. Further, curtailed study times appear to exaggerate the effects of distraction. We conclude that auditory distraction not only reduces memory performance but also interferes with meta-memory processes, potentially increasing the disruptive effect observed.

Oral Presentation

The effect of a storyteller's gaze direction on memory performance and psychophysiological responses in children

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Previous research has shown that direct gaze of an instructor affects cognitive performance, most often in a positive way. It has been proposed that enhanced autonomic arousal caused by eye contact and/or the effect of eye contact on attentional processes might mediate this effect. In adult participants, it has been shown that direct gaze enhances autonomic responses, especially in interactive situations. For children, no corresponding evidence has been previously presented. In the present study, we investigated whether the gaze direction (direct gaze, downcast gaze) of a storyteller and the participant's belief of whether the storyteller was able to see him/her affect memory performance in five-year-old children (36 boys, 37 girls). The latter manipulation was realized with a deception procedure using a one-way mirror. Also, skin conductance and heart rate deceleration responses indexing sympathetic arousal and attentional orienting, respectively, to direct and downward gaze were measured. The results showed that children's performance was worse for downcast than direct gaze in a condition where the children believed that the storyteller did not see them. Gaze direction had no effect on performance in a normal viewing condition. The psychophysiological data indicated that, in both viewing conditions, autonomic arousal and attentional orienting were greater to direct than downcast gaze. To summarize, the study demonstrated that a storyteller's gaze direction affects children's memory performance, but this effect may depend on whether the situation is interactive or not. The results also showed that the direct gaze enhanced autonomic responses in small children, similar to previous findings in adults. However, in contrast to adults, in children, this effect was also found in a non-interactive situation. The role of arousal and attentional processes mediating the effect of direct gaze on memory performance will be discussed.

Oral Presentation

Memory frames: The effect of retrieval query format on source recollection

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The way memory questions are framed influences the information that is specified, monitored and retrieved during remembering. This fMRI study aimed at clarifying how the framing of the retrieval query shapes the neural basis of source recollection. During encoding, participants made semantic (pleasantness) or perceptual (number of letters) judgments about words. Subsequently, in a source memory test, the retrieval query was manipulated such that for half of the items from each encoding task, the retrieval query emphasized semantic information (Is this word from the pleasantness task?), whereas for the other half the retrieval query emphasized perceptual information (Is this word from the letter task?). Results yielded a main effect of retrieval query, such that the semantic query produced greater source recognition than the perceptual query. We also found a significant interaction between retrieval query and encoding task. The advantage of the semantic query was larger for items encoded in a perceptual manner. fMRI data showed that the way the retrieval query was framed modulated the neural network of source remembering. The semantic query, relative to the perceptual query, recruited L lateral and medial PFC, middle temporal and posterior occipital areas. Interestingly, the semantic query, but not the perceptual query, prompted differential activation depending on the items origin. For items semantically encoded, the semantic query induced activation in medial PFC, hippocampal, parahippocampal and middle temporal cortex. For items perceptually encoded, the semantic query recruited the lateral PFC and occipital-fusiform areas. Importantly, the semantic query also influenced the processing of new items, eliciting greater L lateral and medial PFC activation. The results support the view that the semantic query promotes the specification and monitoring of features that are more diagnostic of the previous experience.

Oral Presentation

Age of acquisition and frequency affect memory: Evidence from free recall of pictures and words

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The advantage of processing early acquired items over late acquired items in lexical and semantic tasks across a number of languages is well documented. Interestingly contradictory evidence has been reported in recall tasks where participants perform better overall on late acquired items compared to early acquired items in English (Dewhurst, Hitch & Barry, 1998). Moreover, free recall has also been reported to be modulated by frequency as well as list type in that studying pure lists of high frequency words or low frequency words typically leads to a recall advantage for high frequency words (Dewhurst, Brandt & Sharp, 2004). This recall advantage either disappears or is reversed when the same items are presented in mixed lists containing both high and low frequency items (Dewhurst et al, 2004). The current experiment aims to shed further light on this discrepancy by exploring the influence of AoA and frequency on free recall on standardised pictures and their names (words) in Turkish in mixed and pure lists (Raman, Raman & Mertan, 2014). Eighty participants were recruited from Yeditepe University and were assigned to either a picture (N=40) or a word condition (N=40) in which stimuli were presented in either a mixed or a pure list. Following a distracter task, participants were asked to recall as many pictures or words as they could remember from the list they viewed. The findings lend partial support to the previous findings in English and the implications are discussed within the context of current cognitive frameworks.

Oral Presentation

The foreign language effect on moral judgments involving material consequences

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The foreign language effect is a phenomenon in which individuals make more logical and rational decisions when using a foreign language as opposed to their first language (Keyser, Hayakawa, & An, 2012). This is because using a foreign language creates emotional and psychological distance, which then leads to greater reliance on cognitive processes rather than emotional intuitions. Given that moral judgments are heavily influenced by emotions, this study aimed to examine whether the nature of moral judgments made would differ when individuals used their first versus second language. In accordance with the foreign language effect and Greene's (2007) dual process theory of moral judgment, it was hypothesized that when individuals use their first language, they would make utilitarian judgments in moral dilemmas evoking weak emotions but deontological judgments in moral dilemmas evoking strong emotions; however, when individuals use their second language, they would make utilitarian judgments regardless of the level of emotionality of the situation. This study employed a 2(Language Dominance: English, Chinese) x 2(Language of Presentation: English, Chinese) x 2(Strength of Emotions: Weak, Strong) x 2(Severity of Consequences: Severe, Mild) mixed design. Ninety-six English-Chinese bilinguals were presented with eight hypothetical situations depicting individuals who acted immorally for financial gain, and were asked to rate how severely they blamed each immoral act. A mixed 4-way ANOVA revealed that there was no significant difference in the nature of moral judgments made when participants used their first versus second language, as participants responded in a utilitarian manner across all conditions; thus, the hypothesis is not supported. However, regardless of language dominance, there was a significant difference in the participants' moral judgments that was dependent on the language of presentation of the moral dilemmas, thus suggesting the possibility that language may have served as a cultural prime. Theoretical and practical implications are discussed.

Oral Presentation

Bilingual language control and speech monitoring: Two sides of the same coin?

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Language control is a mechanism that makes it more likely to select words in the target language. It has been proposed that this occurs by increasing the activation of the target language or by inhibiting the non-target language. Yet, it could be that language control, at least partially, relies on speech monitoring, which is a process that controls the message of speech, and whether it is linguistically correct (i.e., correct words are selected, spoken, and put in the correct grammatical structure). To investigate the overlap between language control and speech monitoring, we implemented a traditional task from speech monitoring, namely the network description task. In this task, participants have to describe the path of a dot over a network of pictures that are connected by different types of lines. We introduced a slightly different version of this task, which would allow for bilingual language production (something that has not yet been done). This new version consists of differently colored picture frames that indicate to the participants to speak in a specific language. By comparing bilingual errors, corrections, and error-to-repair times to their lexical, phonological, and syntactic counterpart, we have observed some differences and some similarities between language control and speech monitoring. A similar pattern was observed by examining the effect of language switching on these variables and others (e.g., repetitions, filled pauses). Hence, it appears that language control and speech monitoring might overlap, but are not the same.

Oral Presentation

"Semantic P600" in second language sentence processing: When syntax conflicts with semantics

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In sentence processing, semantic violations (e.g., "The pizza was too hot to *drink") typically give rise to an N400 effect in EEG, while syntactic violations are associated with a P600 effect. Surprisingly, previous studies have demonstrated that semantic reversal anomalies (e.g., "The fox that shot the hunter…") elicit a P600 effect instead of the expected N400 (e.g., Kolk et al., 2003). This phenomenon is interpreted as a consequence of the conflict between syntactic parsing (the fox as the doer) and heuristic processing (the hunter as the doer) built on semantic information (Ferreira, 2003). We made use of this effect to investigate the claim that grammatical processing in second language (L2) speakers based more on semantic heuristics than on syntactic information (Shallow Structure Hypothesis; Clahsen & Felser, 2006). If this claim is true, L2 speakers should accept semantic reversal anomalies as correct more often and, possibly, fail to show the P600 effect. We recorded event-related potentials (ERPs) in 40 German learners of Dutch and a control group of 25 native speakers of Dutch while they read sentences containing reversal anomalies and made semantic judgments. Additionally, individual participant characteristics like L2 proficiency and working memory capacity were measured. Results show, first, higher acceptance rates for reversed sentences in L2 than L1 speakers, confirming our expectation. In contrast, in the ERP analysis of correctly answered trials, L1 and L2 speakers alike showed a P600 (instead of a N400), replicating and extending earlier (L1) studies. Thus, in correctly judged sentences, L2 speakers show native-like processing of these anomalies, with little evidence for fundamental L1-L2 differences in terms a larger role of heuristic processing strategies in L2. Results will be further discussed in terms of the development of L2 syntactic processing and the role of individual differences.

Oral Presentation

Cognate and non-cognate representations in Greek-English bilingual adults and children: a cross-script investigation using the masked priming paradigm

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Two experiments investigated cognate and non-cognate translation priming in two languages, Greek and English. Experiments 1a and 1b involved adults with either Greek or English as their dominant language who participated in a masked priming lexical decision task. The experimental stimuli were cognate and noncognate repetitions and translations where either the prime was in the dominant language (L1) and the target in the non-dominant (L2), or vice versa. The control baseline involved form-related nonword primes suitable either for the target (Exp.1a) or translation language (Exp.1b). Priming for cognate translations was found relative to the control baselines only in the L1-L2 direction (priming asymmetry). Significant repetition priming was found in both languages for both language dominance groups. In Experiment 2, the task was the same but participants were 9 to 11 year old bilingual children, with Greek or English as their dominant language. Stronger priming was observed for cognate translations from L1 to L2 than from L2 to L1, whereas repetition priming was found in both languages for both language dominance groups. Translation priming was not observed for non-cognates in either Experiment 1 or Experiment 2. The results are congruent with previous research where the control baseline was an unrelated word. The role of cognate and non-cognate translations in bilingual word processing is discussed within theories of bilingual representations of adults and children, focusing on the developmental perspective.

Oral Presentation

Learning from internal and external error signals in second language acquisition

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Language users are assumed to monitor their performance by means of an internally generated error signal, in order to improve future behaviour. In case of second language learners, such performance monitoring cannot rely on an internal signal as long as representations are not yet stable. Instead, learners rely on external error signals in the form of feedback. Yet, how feedback shapes internal performance monitoring and learning is not clear. Unexpected feedback to a response is known to elicit an early negative component known as Feedback Related Negativity (FRN), while the error signal yielded by internal monitoring elicits an Error Related Negativity (ERN). In this study, we examine firstly, whether the FRN declines over time as feedback becomes less surprising, secondly, whether the size of the FRN can predict an improvement in subsequent behavioural performance, and thirdly, whether a decrease in the size of FRN is accompanied by the development of an ERN. German learners of Dutch performed a 2AFC task in which they decided on the correct determiner ('de'/'het') for Dutch nouns while their EEG was measured; target nouns were Dutch-German cognates whose gender is incongruent between the two languages that are known to generate many errors. Every response was followed by feedback and the same nouns were repeated in three rounds, such that participants had a chance to learn from mistakes. Preliminary analyses suggest the occurrence of an FRN for negative versus positive feedback, which declines after the first round of feedback. This effect occurs in combination with a P3 for negative feedback that increases over three rounds and differs depending on accuracy in the subsequent round. Response-locked data show a small ERN in the third round. These results will be discussed in relation to learning indicated by behavioural responses.

Oral Presentation

Numerosity extraction in young children : Evidence from the distribution game

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How do humans estimate number ? Most previous studies have used number words or Arabic numerals as stimulus or response modality. Such situations cannot provide direct evidence of an estimation mechanism independent of the cultural symbol systems. In place we propose the "distribution game", which requires to match an input non-symbolic numerosity to an output non-symbolic numerosity. We present three studies with 3 to 6 year-old children, which provide further evidence that young children are capable of extracting an approximate representation of the numerosity of visual collections without using counting. Their estimates are not based on the continuous dimensions of the stimuli but rather on abstract number, and they show the variability signature of the accumulator principle. Furthermore, the data provide evidence that the accuracy and the acuity of children's estimates is related to their knowledge of verbal numerals and to their expertise in counting.

Oral Presentation

Oral Presentation

The involvement of an inhibitory mechanism to select arithmetic facts: A developmental study

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The main goal of the present study was to determine the involvement of an inhibitory mechanism to select arithmetic facts in children from 8-9 to 12-13 years of age. To this end, we evaluated the coactivation of arithmetic facts and the possible inhibitory mechanism responsible to select the correct one. We used an arithmetic verification task, which was an adapted version of the negative priming paradigm. In this task, children received additions and they had to decide whether they were correct or not. When an addition was incorrect but the result was that of multiplying the operands (e.g., 2 + 4 = 8) children from 10-11 years of age onwards took more time to respond relative to control additions with unrelated results. This result showed that the coactivation of arithmetic facts observed in adults was already present in 10-11 years old children. In the same way, children from 10-11 years of age onwards took more time to respond when an addition whose result was that of multiplying the operands of the previous trial was presented (e.g., 2 + 6 = 8) compared to a control condition. This finding showed the development of the inhibitory mechanism involved in the selection of arithmetic facts from elementary to high school.

Oral Presentation

Tracking practice effects in computation estimation

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Numerous studies in the field of numerical cognition investigated the processes involved in exact calculation. Relatively little research has attempted to explore how people estimate the results of arithmetic problems, although this is a useful skill in many real life circumstances. The present study examined college student's ability to estimate the results of multi-digit multiplication problems and the extent to which this ability improves with practice during the experimental session. Participants judged whether the results of multiplication problems were larger or smaller than a given reference number, which was either close or far from the exact answer. The effects of practice, size and distance of the reference number from the exact answer were examined using four measures of performance: speed, accuracy, strategy, and eye movements. The results show that together with enhanced speed and accuracy with practice, participants also changed the strategy they used and the pattern of eye movements. Specifically, participants reduced their use of the approximate calculation strategy and increased their use of the sense of magnitude strategy which is grounded in the Approximate Number System. This was done especially for trials in which the reference number was far from the exact answer, thus exhibiting improved adaptivity in strategy choice with practice. The eye movement analysis showed longer gaze time and more frequent first fixations toward the reference number with practice. Thus, the results suggest that with practice participants made more use of the reference number and relied more on their approximate number system to solve this task.

Oral Presentation

Identifying the cognitive predictors of early counting and calculation skills: Evidence from a longitudinal study

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Learning to count and calculate are vital first steps towards mathematical competence. Empirical studies indicate that both early counting (Aunola, Leskinen, Lerkkanen, & Nurmi, 2004; Johansson, 2005) and calculation skills (Krajewski & Schneider, 2009; LeFevre et al., 2010; Aunio & Niemivirta, 2010) are effective predictors of later mathematical attainment. Recent theoretical models propose that phonological processing, visual-spatial short-term memory (STM) and non-symbolic quantitative skills are independent cognitive factors that differently influence these early number skills (Krajewski & Schneider, 2009; LeFevre et al., 2010). This study examines the extent to which phonological awareness, visual-spatial STM, and precise and approximate non-symbolic quantitative skills predict growth in counting and calculation skills in 125 four-year-olds over a 14-month period. Children's age, processing speed and general conceptual abilities were controlled for. As expected, phonological awareness influenced early sequential counting, although it failed to predict growth. Phonological awareness, visual-spatial STM and approximate quantitative skills all supported growth of early calculation skills. Children's efficiency at discriminating between quantities within the subitising range (up to three discrete items) supported growth in cardinal counting. This pattern of findings suggests that children with different cognitive profiles will experience difficulties with different mathematical skills. Assessing children's cognitive profiles at the start of schooling could help providing targeted support in these early number skills and addressing potential difficulties before they become entrenched.

Oral Presentation

12:50 - 13:10 | Amoroza A

Testing the mental architecture of processing symbolic and non-symbolic numerical information

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Numerical information can be conveyed using symbolic (e.g., digits) or non-symbolic (e.g., arrays of dots) representations. The processing of the numerical value and the processing of the numerosity develop separately, and are assumed to be interconnected. The mental architecture of the two processes is of interest. In the current study we used the Millers' inequality and the systems factorial technology (SFT) methods to test the information-processing architecture of the two processes. We used the divided attention paradigm in which participants were instructed to detect a target in either one or two of the information channels. When reporting the mere existence of a magnitude (Exp. 1) and when performing parity judgments (Exp. 3), processing occurred in an independent, parallel fashion. In contrast, when carrying out comparative judgments of magnitudes, processing occurred through an interaction between the channels (Exp. 2). These results imply that the extraction of an exact cardinal magnitude and the extraction of parity information are conducted separately in each of the symbolic and non-symbolic channels. Activation of the mental number line, and the use of ordinal rules, leads to a co-activation in the processing of magnitudes.

Oral Presentation

Anticipation processes in L2 speech comprehension: Evidence from ERPs and lexical recognition task

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Speech comprehension is usually more challenging in a second (L2) than in a first language (L1). The present study investigated whether anticipation processes take place in L2 listening comprehension, like in reading comprehension (Foucart, Martin, Moreno, & Costa, 2014). We recorded French-Spanish late bilinguals' brain activity as they listened to high-constrained Spanish sentences. The ERPs were time-locked on the article preceding the critical noun, which was muted to avoid overlapping effects. Articles that mis-matched the gender of the expected nouns triggered a negativity (280-680 ms). A subsequent lexical recognition task revealed that, although both "expected" and "unexpected" words were muted during the listening phase, "expected" words were (falsely) recognized significantly more often than "unexpected" words. Overall, the results suggest that, like in L1 (Foucart, Ruiz, Costa, in press), anticipation processes are at play during L2 speech processing, and they allow creating a memory trace of a word prior to presentation.

Oral Presentation

Formality variation in spontaneous speech: Corpus data on the influence of listener status

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Formality is one of the most important dimensions of variation in language, but it is an ongoing challenge to grasp the relation between particular speech situations and linguistic features. A model for variation in formality is proposed, in which formality is the result of parameters in a multidimensional linguistic space. One of those parameters is the relation between the participants in a speech situation. We investigated how speakers adapted their speech to the degree of formality the listener displays and whether variation in formality is gender specific. Our formality corpus, specifically created for the purpose of this research, contains five hours of speech of twelve male and thirteen female native Dutch speakers, retelling eight short films to confederates, who were instructed to act and dress as either formal or informal listeners. The formal confederates were highly educated, of older age and surveillance guards at student exams. The informal confederates were undergraduate students just like the participants. The results of a questionnaire confirmed that participants indeed felt influenced. Evidence was found that the same information was retold in a different way according to the listener: in the formal situation, participants used a lower articulation rate and more nouns, whereas in the informal situation more interjections, first-person singular pronouns, adjectives, coordinating conjunctions and more incidences of laughter occurred. There was no interaction between formality and gender, but we did find that male speakers used longer words, while female speakers used more adverbs and laughed more often. Our investigation indicates that, independent of other parameters influencing formality, an informal listener elicits subjectivity and involvement, while a formal listener elicits precise and informational speech. For the first time, it has been empirically shown that the degree of formality between participants in a communicative situation plays an important role in how identical information is shared.

Oral Presentation

Integration of "secondary" information during comprehension: Co-speechgestures in English and mouth patterns accompanying British Sign Language signs

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Numerous studies now highlight multimodal aspects of language comprehension, not only studies in which acoustic/visual aspects of speech influence perception but also those showing how aspects of communication traditionally considered "nonverbal" affect comprehension. We investigate how information conveyed by a primary linguistic channel (speech in English, hands in British Sign Language, BSL) is affected by secondary information conveyed visually (iconic gestures in English, mouthings in BSL). We digitally edited video clips of spoken English words and BSL signs, producing materials in which these two types of information are incongruent, and in which the speaker's/signer's face is fully visible. We conducted four picture-video matching experiments to test how comprehenders integrate such information.   In Experiments 1 (English) and 2 (BSL), participants were instructed to ignore the secondary channel (English: gestures; BSL: mouth patterns) and respond affirmatively only if the primary channel (English: speech; BSL: hands) matched the picture. In both Experiments, incongruent combinations interfered with performance, more than doubling error rates versus cases in which both channels were congruent, even though the secondary information was explicitly task-irrelevant. In Experiments 3 and 4, both channels were task-relevant: participants should respond affirmatively if any cue matched the picture. In English, incongruent speech and incongruent gestures both increased error rates compared to congruent combinations. Incongruent speech affected accuracy more than incongruent gestures, but to a lesser extent in non-native speakers who relied more on gestural information. In BSL, for fluent signers incongruent mouthings had a modest cost, while incongruent hands resulted in much lower accuracy. This pattern was comparable for fluent, native deaf and hearing signers. Advanced but nonfluent hearing signers were effectively insensitive to mouth patterns.   We will discuss these findings in terms of semantic integration, and how experience with a language can modulate the utility of the different cues available.

Oral Presentation

12:30 - 12:50 | Amoroza B - C

Spatio-temporal dynamics of word selection in speech production: Insights from electrocorticography

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Different regions of the left lateral and medial prefrontal cortex (PFC), and of the left temporal cortex (LTC) are associated with word selection but their role and how they interact remain underspecified. We recorded electrocorticography (ECoG) in 9 neurosurgical patients to examine where and when subregions of the PFC and the LTC were engaged in word selection (7 left, 2 right hemisphere cases). Patients performed picture naming wherein semantic context was manipulated to affect word selection difficulty: pictures of objects were presented within semantically-homogeneous or heterogeneous blocks. Subjects' performance was worse in homogeneous vs. heterogeneous blocks, showing the classic semantic interference effect also observed in controls. High-gamma (HG, 70 to 150 Hz) amplitude, indexing cortical activation magnitude, was sensitive to semantic interference at several cortical sites (greater in homogeneous vs. heterogenous blocks). Early effects were seen in HG activity starting before 250 ms post-stimulus at posterior inferior LTC and middle and superior frontal sites. Response-locked effects were seen in medial and left lateral PFC activity peaking before vocal onset and also in posterior superior and middle LTC activity peaking after vocal onset. Finally, across trials, HG amplitude co-varied between responsive left PFC and LTC sites. Our results suggest that posterior inferior LTC engages in word selection as semantic concepts become available. Posterior medial and left PFC activity provides top-down control over LTC regions to help solve competition for word selection trial-by-trial. Finally, response-locked posterior LTC activity may reflect a speech monitoring mechanism sensitive to word selection difficulty. Interestingly, one patient, whose seizure focus was in the posterior medial PFC, had very poor performance. His data was thus analyzed separately. His behavioral semantic interference effect was more than 3 standard deviations larger than that of the other patients, again supporting a causal role of the posterior medial PFC in word selection.

Oral Presentation

Ten things I like about /y/: Testing the mirror neuron hypothesis of sound symbolism using a non-English vowel

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*The vowel /y/ is not part of the sound system of the English language. * It has the high front tongue position of /i/ (the vowel in 'feet'), and the lip rounding of /u/ (the vowel in 'shoe'). */y/ occurs in many European languages, *as well as in Mandarin Chinese (written as "u" with umlaut). *Since /y/ doesn't occur in English, few studies have investigated psychoacoustic processing of this high, front, rounded vowel... * ...and none have investigated /y/ for its sound symbolic properties, or crossmodal congruences. *Theories of sound symbolic congruence have implicated mirror-neurons in making the /u/ sound in words like 'bouba' seem more curvy than the /i/ sound in words like 'kiki', due to visual/somatosensory shape of rounded lips in the articulation of /u/ (Ramachandran & Hubbard, 2001). However these claims have not been tested in cases where lip shape (round/unround) is dissociable from tongue position (i.e., backness and height). *In a series of studies, we compare cross-modal matching tasks for vowels /i/, /a/, /u/, and /y/, in the domains of visual shape, visual size, flavour and touch, for people who speak /y/ languages. *We found /y/ tastes bitter like /i/, looks knobbly and small like /i/, also feels knobbly like /i/. Unlike /i/, it looks somewhat curved, but only when spindly (unlike /u/). *Therefore, for people who speak /y/ languages, acoustic correlates of tongue position (high front - shared with /i/) account for a greater degree of congruence for /y/ than does lip rounding (shared with /u/). However, different sensory attributes map to different articulatory dimensions. These findings suggest that sensory congruences generated by speech sounds are not the product of an undifferentiated system, but are modulated differently across different sensory conjunctions, and that acoustic properties of speech may provide a better model than articulatory properties.

Oral Presentation

Using covert response activation to test latent assumptions of formal decision-making models

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Most decisions we make build upon multiple streams of sensory evidence, and control mechanisms are needed to filter out irrelevant information. Sequential sampling models of perceptual decision-making have recently been enriched by attentional mechanisms that weight sensory evidence in a dynamic and goaldirected way. However, the framework retains the longstanding hypothesis that motor activity is engaged only once a decision threshold is reached. To probe latent assumptions of these models, neurophysiological indices are needed. We hence collected behavioral and electromyographic (EMG) data in the flanker task, a standard paradigm to investigate decisions about relevance. While the models captured response time distributions and accuracy data, EMG analyses of response agonist muscles challenged the assumption of independence between decision and motor processes. Those analyses revealed covert incorrect EMG activity ("partial error") in a fraction of trials where the correct response was finally given, providing intermediate states of evidence accumulation and response activation at the single trial level. We extended the models by allowing motor activity to occur before a commitment to a choice, and demonstrated that the proposed framework captured the rate, latency and EMG surface of partial errors along with the speed of the correction process. In return, EMG data provided strong constraints to discriminate between competing models that made similar behavioral predictions. Our study opens new theoretical and methodological avenues for understanding the links between decision-making, cognitive control and motor execution in humans.

Oral Presentation

11:50 – 12:10 | Amoroza D

Effects of learning on somatosensory and auditory decision-making and experiences: Implications for medically unexplained symptoms

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The phenomenon of medically unexplained symptoms (MUS), where patients experience disabling physical symptoms in the absence of medical pathology, is a striking example of how perception often misrepresents sensory input. Recent theory likens MUS to somatic false alarms (FAs) and suggests that training to reduce somatosensory FAs more generally might result in decreased symptom reporting. We sought to test this idea in two studies investigating (i) whether the FA rate in a somatosensory signal detection task (SSDT) could be altered with operant conditioning; and (ii) whether this learning would transfer to other sensory decisions as measured by spontaneous sensation (SPS) and voice detection tasks (VDT). In Study 1, non-clinical participants (n = 34) were rewarded for hit responses and punished for misses on the SSDT, with a view to increasing their FA rate. In study 2, participants (n = 39) were rewarded for correct rejections and punished for false alarms, with a view to decreasing their FA rate. Control participants (n = 41 and 37 in Study 1 and Study 2 respectively) underwent pseudo-training procedures. All participants completed the VDT and SPS before and after the SSDT training to study perceptual transfer. As predicted, operant conditioning increased (study 1) and decreased (study 2) FAs on the SSDT; this effect transferred to FAs on the VDT in study 1 only. Neither study showed transfer on the SPS. The results suggest that it is possible to train perceptual distortion and that this may generalize to other perceptual decisions under some circumstances. This has potential implications for the mechanisms and management of MUS.

Oral Presentation

Avoiding the conflict: Metacognitive awareness drives the selection of lowdemand contexts

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Previous research has spent much effort to explain how humans strategically change behavior in order to achieve successful task performance. However, apart from this strategic adaptation, it has recently been shown that another strategy is to simply avoid tasks that are too demanding. In the current study, we report two experiments that investigate the theoretically debated role of metacognitive awareness in this process. In these experiments, participants could freely choose between performing a task in either a high demand or a low demand context. Using subliminal priming, we assured that participants were not aware of the visual stimuli creating these different demand contexts. Our results showed that participants who noticed a difference in task difficulty (i.e., metacognitive aware participants) developed a clear preference for the easiest context. On the contrary, participants who felt no difference in task difficulty did not develop a preference. Thus, only subjects who were able to accurately introspect about their own behavior were able to preferably select the low demand context. We conclude that metacognitive awareness plays an important crucial role in the strategic avoidance of demanding tasks.

Oral Presentation

How do we know what we see and remember? The influence of task decision on awareness ratings in perception and memory

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How do we know what we are aware of? Does anything beside the stimulus-related evidence influence our metacognitive awareness? Here, we present six studies aiming to investigate this problem in the context of visual awareness (E1-E4) and awareness of memory content (E5-E6). In E1-E4 we measured perceptual awareness either before, or after decisions in Gabor patches visual identification task. The results of E1 and E2 showed that awareness ratings strongly predicted identification accuracy, but this effect was weaker when awareness rating preceded identification response. We interpreted this as a result of either bigger amount of time that participants had to estimate their metacognitive awareness, or of the influence of the decision itself on awareness rating. Thus, we run E3 and E4 to test these two contradictory interpretations by separating decision time and identification/awareness rating order. The results showed both, the effect of time and also the effect of decision itself on awareness ratings. We observed similar effect in memory tasks. In E5 participants were asked to remember lists of words and then to choose a word previously presented either before or after assessing their confidence in correct recognition. In E6 participants were working on anagrams and asked to decide whether a presented word was the solution, either before or after determining their confidence in the right decision. Similarly to the results of perceptual studies we showed that although accuracy always correlated with confidence, this relationship was weaker when metacognition was assessed before the decision. We interpret these results in line with hierarchical theories of consciousness suggesting that metacognitive awareness is not only based on low-level visual processing, but also influenced by postdecision processing.

Oral Presentation

Decision Mechanisms Underlying Increased Reaction-Time Variability in ADHD

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It is well-established that participants with attention-hyperactivity/deficit disorder (ADHD) exhibit increased rate of exceptionally slow reaction-times (RTs). The common theoretical explanation is that exceptionally slow RTs reflects lapses of attention, or events where momentary failures in processing occur. The current study explores which locus (perceptual categorization vs. retrieval of action rules from working memory) and temporal continuity (momentary lapses vs. constant deficit) underlies the increased rate of exceptionally slow RTs found in ADHDs. Three choice-reaction tasks with low and high working memory demands were administered to a group of college students, either with ADHD or with no psychiatric disorders. Ex-Gaussian fitting revealed increased rate of exceptionally slow RTs for ADHDs under all working memory conditions, with this difference being larger for high working memory load conditions. Evidence accumulation modeling indicated that this result is not due to momentary lapses or a constant deficit in perceptual categorization, but rather due to constant impairments in working memory operation efficiency.

Oral Presentation

12:50 – 13:10 | Amoroza D

Oral Presentation

14:20 – 14:40 | Akamas A

Media multi-tasking and executive functions in young adults

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Media multi-tasking (MMT), the usage of several streams of media concurrently, has become prevalent among young adults. This tendency is surprising, given decades of research showing that people are essentially limited in performing more than one task simultaneously. Initially it was assumed that individuals engaging in excessive MMT, which requires constant monitoring and switching between multiple media streams, would show improved cognitive control abilities. Contrary to this assumption, several studies revealed that excessive, compared to low MMT, was correlated with poorer performance on laboratory tasks requiring attentional filtering and executive control. Nevertheless, other studies failed to find a relationship between MMT and cognitive functioning. One reason for the inconsistency between studies may be the use of laboratory measures of cognitive functioning to evaluate the everyday behavior of MMT. In the present study the relation between MMT and cognitive functioning was tested by correlating the extent of MMT with ecological measures of executive functions (EF). A group of 122 students rated the amount of time they spent MMT during a typical week, as well as their personal attitudes towards single-tasking or multi-tasking. Additionally, they filled the Behavioral Inventory of Executive Functions-Adults (BRIEF-A) questionnaire, which provides a broad profile of performance in nine executive functions as they are reflected in everyday behavior. The results demonstrated that participants who reported more difficulties in executive processes related to inhibition, emotional-control, initiation, planning, organization of materials, self-monitoring and task-monitoring also engaged more in MMT, and also showed more positive attitudes towards multi-tasking. Thus, the present results strengthen the relationship between high levels of MMT and poorer EF, generalizing them to ecological measures of EF. The current study is correlational in nature, but may serve as a basis for future studies that would attempt to discern the causal relationship between MMT and EF.

Oral Presentation

A conflict monitoring account of the control mechanisms involved in dualtasking

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The present study investigates the cognitive mechanism underlying the control of interference during dual-task coordination. Partially inspired by the conflict monitoring hypothesis, we test the assumption that dual-task interference is resolved by a top-down adaptation mechanism that is responsible for behavioural adjustments in the prioritisation of the coordinated tasks. In a series of two experiments, we measured conflict adaptation to the so-called Gratton effect—the decrease in dual-task interference following incompatible trials. In Experiment 1 the primary task was a low demand choice discrimination task, whereas in Experiment 2 the primary task was an updating task that imposes a continuous load on working memory. The secondary task was a tone discrimination task. Both experiments consistently showed that the response conflict of previous trial triggers top-down behavioural adjustments that reduce interference. We conclude that dual-task interference shows strong similarities to Stroop-like types of cognitive interference, namely in the way that suboptimal performance is dealt with by the cognitive system.

Oral Presentation

Response selection and crosstalk as explanatory concepts in multiple action control: Differences and commonalities

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Performing several actions around the same time usually yields interference phenomena, which are commonly explained by referring to resource limitations, (response selection) bottlenecks, or crosstalk. However, until now there are only sparse attempts to examine theoretical differences and commonalities between these explanatory concepts based on suitable empirical data. In the present study, we focus on mechanisms underlying response selection and crosstalk by examining the execution of cross-modal response compounds (eye movements and manual responses) triggered by single stimuli. We examine interference effects (i.e., worse performance under dual- vs. single-response conditions) for compatible and incompatible responses (addressing the issue of within-trial crosstalk) under conditions with or without selection requirements (addressing the issue of response compound selection bottlenecks). The results indicate evidence for both types of costs (i.e., resulting from crosstalk and response selection), but also suggest substantial residual costs in the absence of strong crosstalk and selection demands (i.e., general dual-execution costs). Based on these results, we speculate about the extent to which response selection can be interpreted as a special case of (between-trial) crosstalk.

Oral Presentation

Oral Presentation

15:20 - 15:40 | Akamas A

Development of executive functions and self-regulation regarding to academic achievements

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The study shows how executive functions (EF) in both aspects: cognitive and behavioural develop during early school years and how this development affects school achievement. Executive functions were measured by executive cognitive task performed on tablet, whereas self-regulation (behavioural executive functions) were tested by questionnaire filled in by parents and teachers. Study based on two groups of children: five years old in preschool class (N=99) and six years old in first grade (N=100), both levelled in terms of gender. Children were tested at the beginning (autumn 2014) and at the end of school year (spring 2015). This project takes into consideration development of EF and behavioural executive functions, allowing for socio-economical status (SES) and children's age. The analysis of the research will be consisted of four steps. First of all, confirmatory analysis of variation (CFA) which indicates fit indexes of all investigated factors. In the first measurement all fit indexes were good and significant. In the second step this research will show which of EFs were most efficiently developed during one academic year in both groups and whether this change was significant or not. In the third step of analysis researchers will measure, using Structural Equation Modelling (SEM,) whether it is cognitive functions or self-regulation that have more effect on school achievement and whether those constructs are correlated with each other or not. The last step of this project will be checking if measurement of early cognitive EFs (beginning of school year) can help us to predict future school achievements (end of school year).

Oral Presentation

<div align="right">**15:40 - 16:00 | Akamas A**</div>

Backward-crosstalk is due to response selection, not response activation

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When people are required to perform two tasks in close succession, performance already in Task 1 is facilitated if Task 2 requires a compatible response (e.g., when both responses entail a spatial "left" component). Such influences of Task 2 characteristics on Task 1 performance have been coined backwardcrosstalk effects (BCEs). To account for BCEs, several authors suggested to sub-divide the central stage of task processing into (1) parallel response-activation followed by (2) serial response-selection: Overlaps in parallel response-activation are then the source for BCEs. Building on the same theoretical framework, the locus-of-slack logic then directly predicts that BCEs should combine underadditively with a manipulation of stimulus onset asynchrony (SOA) in PRP experiments. I report experiments where various versions of BCEs were investigated in such situations. In all these cases, however, the BCEs combined additively with the SOA manipulation. Traditionally, this pattern is taken to argue against the source of an effect being located before the bottleneck – and consequently my results are at odds with the account of BCEs described above. Rather, they suggest that BCE arise from the serial, capacity-limited stage of response selection.

Oral Presentation

Mental subtitles in the mind's eye. Characteristics and prevalence of tickertape "synaesthesia"

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Routinely visualising the orthographic appearance of words that one hears, speaks or thinks, like mental subtitles in the mind's eye, has been referred to as "tickertaping", or as "tickertape synaesthesia". Despite qualitative reports dating as far back as Francis Galton, the phenomenon is little known or studied. We will describe tickertaping, present an overview of current knowledge, and summarise some behavioural correlates that were observed in a case study of a tickertaper who is able to enumerate letters in heard words with exceptional speed. We also report a survey, among 425 Norwegian adults from varied sub-samples, of the prevalence, character and associated skills of tickertaping. Our questionnaire was designed to reflect different degrees of automaticity of the experience. While strongly automatic tickertaping appeared rare (95% CI = 0.6% to 3.2% of sample), lesser degrees of text visualisation were reported by more than half of respondents, indicating a continuity between extreme tickertaping and normal cognition. The qualitative character of tickertaping varied among respondents, and included negative experiences. As visualisation of letters was predominantly uncoloured, tickertaping appears to be a phenomenon in its own right and not just a subset of grapheme-colour synaesthesia, contrary to what has sometimes been previously implied. We suggest tickertaping is an explicit expression of the close interconnection between phonemic and graphemic representations of words which, for reasons we do yet understand, manifests as visual imagery with a varying degree of automaticity.

Oral Presentation

Spotting Lesions in Split of a Second - Neural Mechanisms Behind Radiological Expertise

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Theoretical accounts assume that experienced radiologists have acquired vast knowledge of normal and abnormal radiological images, also called schemas. Once they encounter a new image, they automatically compare it with available schemas, quickly making a global impression of the image. This first impression leads immediately and directly to suspicious regions. Less experienced radiologists lack this knowledge and have in turn much harder time identifying suspicious regions. While these cognitive mechanisms are well known, their brain implementation remains a mystery. Here I tackle the neural underpinnings of radiological expertise using the functional magnetic resonance imaging (fMRI). Radiologists were expectedly much better than medical students at spotting lesions in thorax X-rays presented for only 200 milliseconds. However, their performance suffered significantly when the X-rays were presented in the inverted position. This indicates that holistic processes based on acquired knowledge play a crucial role in radiological expertise. Both radiologists and medical students activated a number of brain areas to a similar extent. The differences were, however, specially pronounced in the inferotemporal areas around the fusiform gyrus. Experts showed pronounced activation in this area whereas novices almost lacked any significant activation within the area. Radiologists are rather good on spotting abnormalities in thorax X-Rays even when they were given only a split of a second. Their performance is based on a gestalt-like holistic process based on their accumulated knowledge about normal and abnormal X-Rays. The fMRI results indicate that the fusiform gyrus is a possible neural basis of this remarkable skill. The fusiform gyrus is an important region for visual expertise and it hosts the Fusiform Face Area (FFA) that is responsible for face recognition. Face perception requires holistic processing just as thorax X-Rays and it seems that the same area is responsible for both skills.

Oral Presentation

A specialised brain area for analysis of rapid motion in the peripheral visual field

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We investigated the bold response to fast motion presented to large visual fields. We stimulated the visual cortex using moderate- and high-speed drifting gratings, projected to a large field of view (~ 60°). These stimuli are equally-visible, with an identical contrast envelope and temporal frequency, differing only for speed and spatial frequency by 14-fold. We evaluate responses to these stimuli in subcortical and various cortical visual areas including a new area recently reported in the marmoset monkey. BOLD responses were measured with a GE 3T scanner (Excite HDx, GE Medical Systems, Milwaukee, WI), using a block design. Stimuli were presented with a novel optical setup capable of projecting wide-field images at 120 Hz. Stimulation was monocular (right eye) with all stimuli projected at ~60° eccentricity. Retinotopic maps for seven healthy volunteers were constructed using (i) horizontal and vertical meridian stimulation, (ii) upper, lower, left and right stimulation of the four visual quadrants and (iii) checkerboard stimuli to map eccentricity. Subsequently, we examined activity generated in clearly-defined visual areas (V1, V2, V3, LO, V4, MT) using moderate-speed gratings (0.26 c/deg, contrast 50%, 38 deg/sec) and high-speed gratings (0.018 c/deg, contrast 50%, 571 deg/sec) at 50% contrast and fixed temporal frequency (10Hz). Responses to both types of moving stimuli were balanced in all areas under investigation, except area prostriata which showed a preferential response for high-speed stimuli. Recent investigations have suggested that area prostriata in the marmoset monkey has a unique topographic map that emphasizes the far periphery of the visual field (Yu, Chaplin, Davies, Verma, & Rosa, 2012). Consequently, area prostriata could potentially be part of an alternative pathway responsible for rapid processing of visual information, working in parallel with the traditional dorsal and ventral streams. Here, we report for the first time to our knowledge similar responses in human participants.

Oral Presentation

<div align="right">

15:20 - 15:40 | Akamas B

</div>

Getting more, for less: The benefits of temporal integration in visual Perception

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Brief, successive sensory experiences that occur in dynamic environments may be integrated across longer time intervals by our perceptual system. This temporal integration process is an intuitively plausible way of building perceptual events that span a reasonably meaningful amount of time (i.e., 100-200 ms). It is nevertheless currently not yet clear what the possible costs and benefits of temporal integration might be. We investigated this issue by asking observers to identify up to two targets that were presented amidst distractors in rapid serial visual presentation. The targets were chosen in such a way that they could be reported individually, as in classic paradigms, but that they could also be integrated perceptually to form another valid composite target identity. In a first study, pupil dilation was recorded simultaneously and analyzed as a measure of mental effort. On the basis of the observers' behavior, three cases were compared: Reports of a single target, of two targets, and of a single integrated percept consisting of the features of both targets. Pupil dilation was highest for two-target reports, reflecting increased mental effort, while single-target reports and integrations elicited a comparable lower level of dilation. The effort associated with processing the features of two targets could thus be reduced to that of a single target by means of integration. In a second study, the event-related potential was recorded in a similar task. Two-target responses again seemed to elicit deviant component amplitude, particularly on the P3 and the contralateral delay activity, suggesting that integration may serve to facilitate working memory consolidation. Taken together, the results thus support the idea that temporal integration affords an easy and cost-effective way of processing visual information.

Oral Presentation

15:40 - 16:00 | Akamas B

Evolving the keys to visual crowding

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Peripheral vision can be severely impaired by nearby clutter. Decades of research using sparse displays have established that this phenomenon, known as visual crowding, follows Bouma's law: Interference occurs for target-distractor separations up to half the target's eccentricity. Although considered a fundamental constraint on human vision, Bouma's law has never been tested in more dense visual environments. Using a genetic algorithm we investigated crowding in densely cluttered displays. Participants were instructed to identify the orientation of a target line (6° eccentricity) among 284 distractor lines. Displays supporting highest accuracy were selected ("survival of the fittest") and combined to create new displays. Performance improved over generations, predominantly driven by the emergence of horizontal flankers within 1° of the near-vertical target, but with no evidence of interference beyond this radius. We conclude that Bouma's law does not necessarily hold in dense displays. Instead, a nearest-neighbour segmentation rule provides a better account.

Oral Presentation

A matter of timing: when does learning to read start to impact on nonlinguistic object recognition?

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Mirror invariance (i.e., processing mirror images like b and d as equivalent percepts) is an original property of the visual system entrenched by evolution. This property collides with learning a script with mirrored symbols like the Latin alphabet which requires mirror discrimination. Therefore, examining the impact of literacy on mirror-image processing is one of the most interesting ways to investigate the consequences of literacy on the evolutionary older cognitive system of visual object recognition. In the present study, we investigated when, during reading development, mirror discrimination becomes automatic in object recognition and whether the impact of literacy extends to other orientation-contrasts, considering explicit vs. implicit, automatic processing of orientation. Geometric shapes were presented to preliterate preschoolers and first-grade beginning readers on two same-different matching tasks differing by criterion: orientation-based vs. shape-based (orientationindependent) tasks. On orientation-based judgments, first-graders presented and overall advantage over preschoolers, and preschoolers showed a stronger difficulty with mirror discrimination. Thus, regarding explicit orientation processing, the impact of literacy was stronger for (but not restricted to) mirror images. In contrasts, on shape-based judgments of geometric shapes, the two groups differed only in mirrored trials. Whereas preschoolers were as able to perform shape-based judgments of identical as of mirrored pairs, first-graders exhibited a strong mirror cost: they were slower on mirrored trials, and even slower than preschoolers. This spillover effect of literacy on orientation-invariant object recognition is thus specific to mirror images. It begins to emerge with letter knowledge before literacy instruction and continues to develop along with reading skills.

Oral Presentation

Morphology, Orthography, and Semantics in processing Greek words

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Previous work in processing morphologically complex Greek words showed that processing of word targets in a lexical decision task is facilitated by prior presentation of morphologically related vs unrelated word primes, with both short and long stimulus onset asynchrony (SOA). This can be interpreted as evidence for morphemically structured representations in the Greek lexicon, consistent with studies in other languages (e.g., Rastle, Davis, Marslen-Wilson, & Tyler, 2000). In the present study, we investigated whether priming facilitation between morphologically related word pairs could be attributed to shared orthographic form or shared meaning. Specifically, we examined whether priming is observed with primes that were either orthographically or semantically related to the target words. The same target words as in the previous experiments were used, again in a primed lexical decision task. Two experiments were conducted, one with short and one with long SOA. Data were collected by 65 and 64 native Greek participants, respectively. In the short-SOA experiment, results showed no facilitation by orthographically or semantically related primes. In contrast, in the long-SOA experiment, results showed facilitation for semantically related prime-target words and interference for orthographically related ones. Taken together, these results suggest that morphological priming effects observed in our previous work cannot be explained by orthographic or semantic effects early in visual word recognition. This means that morphological priming effects cannot be attributed to a simple co-occurrence of orthographic and semantic effects (cf. Feldman & Soltano, 1999; Rastle, Davis, Marslen-Wilson, & Tyler, 2000). References: Feldman, L. B., & Soltano, E. G. (1999). Morphological priming: The role of prime duration, semantic transparency, and affix position. Brain and Language, 68(1), 33-39. Rastle, K., Davis, M. H., Marslen-Wilson, W. D., & Tyler, L. K. (2000). Morphological and semantic effects in visual word recognition: A time-course study. Language and Cognitive Processes, 15(4-5), 507-537.

Oral Presentation

Simon effect with biological spatial cues in deaf speakers of sign language

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In this study we investigated broader implications related to the use of sign language. In particular, we focused on whether deaf speakers of the Italian Sign Language (LIS) display any representational or processing specificity for hand-related stimuli. Referential pointing with an extended index finger is an early-acquired gesture frequently used in everyday interactions. Previous studies have shown that it can generate a spatial code even when participants are instructed to ignore it. We investigated this phenomenon in a population of deaf speakers of LIS using a variant of the Simon paradigm, where the task-irrelevant spatial information was provided by a centrally presented and spatially oriented cue. Spatial cues were pointing hands, arrows or faces with spatially oriented gaze. In experiment 1, participants were 32 hearing undergraduate student. Reaction times (RTs) displayed cue-response congruency effects for all cues. In experiment 2, participants were 32 deaf speakers of LIS. Only the arrow and the gaze cues produced congruency effects on RTs, pointing hands did not. Sequential analysis showed that, for hearing participants, congruency effects emerged after congruent trials, while the effect was reduced after incongruent ones. Deaf participants showed a similar pattern for arrow and gaze cues. For pointing hand, congruent trials were followed by standard congruency effects, suggesting that the pointing hand has not lost its spatial connotation. However, trials following an incongruent one displayed a reversed congruency effect, with faster response when the cue was incongruent. Deaf participants were particularly fast in responding to an incongruent stimulus when the exact same stimulus has been presented immediately before. The results suggest that deaf signers can adjust to the irrelevant spatial features when these are conveyed by hand's configuration. Possibly, this flexibility is linked to the extensive use of hands within a linguistic framework.

Oral Presentation

15:20 - 15:40 | Akamas C

A hierarchical generative model of letter perception based on recycling of natural image features

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Letter identification has been extensively studied by cognitive psychologists because it is a key component of the reading process as well as a circumscribed example of the more general problem of object recognition, which implies invariance to a broad range of changes in visual input. How abstract letter identities might be computed from vision is still debated and computational accounts are based on toy models that cannot handle realistic visual input. In the present study we developed a large-scale connectionist model that learns to recognize letters presented as real images in a variety of fonts, styles, sizes and spatial alignments. The model is based on a stochastic recurrent neural network with many layers of hidden neurons (a "deep network"), which builds a hierarchy of progressively more complex distributed representations of the sensory input by fitting a hierarchical generative model. Crucially, earlier processing levels in the model exploit the recycling of domain-general visual features that are learned through the exposure to thousands of small patches of natural images. Accordingly, the first layer of neurons developed receptive fields that efficiently encode natural image statistics (e.g., Gabor filters). We show that this internal representation contains sufficient information for decoding letter identity with high accuracy on a large dataset of letter images. Domain-specific feature detectors resembling abstract letters can emerge in later layers through learning on a sample of letter images, thereby yielding robust and invariant letter perception. We conclude that the statistical information extracted from natural scenes can be readily re-used to represent visual symbols like those used in writing systems and that learning to recognize them only requires a more simple, domain- and culture-specific tuning. These results also support the hypothesis that the shapes of written symbols have been culturally selected to match the statistical structure found in natural environments.

Oral Presentation

15:40 - 16:00 | Akamas C

The role of iconicity in word learning

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Word learning is traditionally characterized as a difficult problem because the word form is only arbitrarily linked to the referent (and moreover, children need to isolate the referent is visually complex environments). However, languages also maintain iconicity (i.e., more transparent relation between form and meaning as in onomatopoeias). This is especially the case for sign languages where visual/gestural modality allows meaningful form/meaning mappings (iconicity) across numerous basic concepts. Thus, iconicity may play a role in vocabulary learning as it makes imagistically available properties of referents in the linguistic form (Perniss et al., 2010). Recent research has shown iconicity effects in processing British Sign Language (BSL) (Thompson et al., 2009, 2010) and that 11-30 month old children know more iconic than non-iconic BSL signs. However, are children really sensitive to iconicity in the input? This is a prerequisite for iconicity to facilitate vocabulary learning. Deaf and hearing children from deaf and hearing parents using sign language were presented with videos of iconic BSL signs while their eye-gaze was tracked. Each video was presented concurrently with a picture on either side (e.g., BSL BIRD and 2 pictures of birds). In one picture, the iconic property of the sign was made salient (a bird with beak well in view) while in the second it was not (a bird flying). Children across the board looked longer at the salient picture compared to the non-salient picture. Interestingly, our preliminary analyses show a larger effect in younger children (<45 months) who look at salient pictures an average of 150ms longer than older children. Moreover, the effect is present for both deaf and hearing children. Overall, the data provide evidence that signing children are sensitive to iconicity and supports the claim that iconicity serves to bridge the gap between linguistic form and human experience.

Oral Presentation

Ownership and Memory: The Mere Ownership Effect depends on Semantic Processing

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Recognition memory is usually better for self-assigned items than for other-assigned items, even in the absence of any meaningful personal connection or actual ownership. This so-called mere ownership effect occurs even in the absence of a task that requires explicit elaboration on the items and their relationship to the self, distinguishing it from phenomena like the self-reference effect. At first glance, this suggests a rather basic role for the self in information processing. However, it remains possible that semantic processing is triggered by self-assignment and that self-owned items are therefore processed more deeply even in the absence of task demands that require semantic elaboration. In a series of five experiments, we investigated the role of semantic content and processing demands in the context of self- and other-ownership. Whereas the mere ownership effect proved to be robust for semantically meaningful material, it was absent semantically meaningless pseudo-objects. Employing a task that required the matching of previously self-assigned, otherassigned and new pictorial objects to verbal labels as a measure, we found that the extent of prior semantic processing predicted the size of the mere ownership effect. Finally, we found that a depth-of-processing manipulation eliminated the mere ownership effect after a "deep" semantic task. The results suggest that the mere ownership effect is at least partially driven by semantic processing, which may be qualitatively similar to the type of semantic elaboration typically induced by a depth-of-processing manipulation.

Oral Presentation

14:40 – 15:00 | Akamas D

Selective directed forgetting: Boundary conditions and underlying mechanisms

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By using an adapted list-method directed-forgetting paradigm, Delaney et al. (2009) showed that cueing participants to selectively forget one set of previously studied items makes these items less recallable than those in the same list that were cued to remember. Although this selective directed forgetting (SDF) effect has been found with slightly modified procedures and different populations, multiple failures to replicate the effect have been published. Besides, the nature and the underlying mechanisms remain unknown. The SDF could be thought as a consequence of memory inhibition. However, it could also be interpreted in terms of rehearsal processes. The purpose of this study is to shed some light into these questions, to explore to what extent SDF relies on executive-control capacity and to identify the cognitive mechanisms responsible for the effect. In Experiment 1 we replicate the SDF effect and show that such effect is a robust phenomenon. In Experiment 2 we manipulate the difficulty of the selection process and create conditions of high and low cognitive demand. We observe a clear SDF effect in the less demanding condition and no evidence of selective forgetting in the highest cognitive demand condition. In Experiments 3 and 4 we use a dual-tasking approach and manipulate the concurrent-task demands. The results show that compromising attentional control after the forget cue hinders the ability to selectively forget, but only when the concurrent task entails high cognitive demands. Moreover, in Experiment 4 we try to identify the mechanism underlying the SDF effect by using an articulatory suppression task. The results reveal that the SDF effect is not affected by this concurrent task, and suggest that selective rehearsal is not the mechanism underlying SDF. To conclude, in this work we provide evidence that SDF is mediated by some controlled mechanism that might be inhibitory in nature.

Oral Presentation

Is it really all relative? The role of relative judgment in absolute identification

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A variety of processes have been put forward to explain absolute identification (AI) performance. One difference between current models of AI is the extent to which the task involves accessing stored representations in long term memory (e.g., exemplars in memory – Kent & Lamberts, 2005) or relative judgement (comparison of the current stimulus to the stimulus on the previous trial – Stewart, Brown & Chater, 2005). In three experiments using the same stimuli we explored this by tapping into these processes. Experiment 1 was an AI task using 8 line lengths whereby a single stimulus was presented on each trial for identification. Experiment 2, used a matching task aimed at mirroring exemplar comparison Eight line lengths were presented in a circular array and the task was to report which of these matched a target presented centrally. Experiment 3 was similar to Experiment 1 except that the task was to report the difference between the current stimulus and that on the previous trial. Data from Experiment 1 and 2 showed clear similarities, supporting the role of exemplar comparison in AI. In Experiment 3, performance was poor and the data suggested that relative judgement does not produce some of the trademark effects in AI.

Oral Presentation   15:20 - 15:40 | Akamas D

The influence of joint attention on visual working memory: Effects of emotional expression

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Joint attention refers to the mutual focus of two individuals on an object. Using a combined gaze cuing and WM paradigm, other work in our lab using a neutral cue face shows that joint attention significantly enhances visual working memory (WM) for coloured squares: looked at squares were remembered better than those not in mutual focus [see Gregory & Jackson, ESCOP 2015]. However, this effect was only found when to-beremembered items were presented on just one side of the cue. When memoranda were presented on both sides of the cue ('bilateral' paradigm), thus requiring broad attention distribution, this effect was substantially attenuated. Here, we used the bilateral paradigm with an expressive cue (angry and happy). The central cue looked left, right or maintained direct gaze, followed 500ms later by 6 or 8 coloured squares for encoding (100ms duration; 3 or 4 squares on each side). After a 1000ms maintenance interval, a single test square was presented centrally and participants stated whether it was present or absent in the preceding display. Crucially, on present trials the test square during encoding had been looked at (Congruent), looked away from (Incongruent), or viewed in the presence of direct gaze. All conditions were pseudo-randomised. Unlike the insubstantial effect found using a neutral cue face, emotional cues elicited significant and robust facilitatory effects of joint attention on WM, but only among low socially anxious participants. Emotional expression did not modulate gaze effects. However, high socially anxious participants showed poorer WM for squares encoded in the presence of an angry versus happy face, suggesting that the presence of threat consumed a portion of the attentional resource required for encoding squares. Thus, under these parameters an expressive cue face more deeply engages joint attention mechanisms in WM than a neutral face, perhaps due to increased motivational salience.

Oral Presentation

Prospective memory and second language education: what influences teachers' evaluation?

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According to Munsat (1967), bad performance on Prospective Memory (PM) may be interpreted as a bad attitude, rather than a memory problem. Therefore, PM maturation may play a role not only on scholastic performance but also on social behavior and peer relationships. While it is clear that PM develops with the puberty age, it has been questioned whether the knowledge of a second language (L2K) could have positive effects on cognition or it is just an epiphenomenon. However, in the educative contexts the relative importance of these factors is reversed: only L2K is assumed to be a relevant issue to be fostered, while PM seems to be often neglected. The present study aims at evaluating whether the development of PM in scholar children (aged 8 and 12) may be influenced by the level of L2K and, in turn, whether these factors can influence social behavior. A group of young adults (20-25) was used as control group. An event-based PM task required participants to press a key whenever a certain picture was presented, while performing a visuospatial-based probed recognition task (as ongoing activity), as a measure of working memory (WM) updating. Moreover, questionnaires measuring L2K and social adaptation were administered to children, their parents and their teachers. Developmental trajectory of both PM and WM was influenced by second language education: highly skilled children were performing better than their peers. Moreover, a series of regressions showed that teachers' perception of social abilities in children depended on both memory tasks performance and level of L2K. These results seem to indicate that, although both PM and L2K are playing a role in scholastic and behavioral evaluation, only the latter is commonly considered as responsible for an enhanced children development.

Oral Presentation

Recently learned L2 words interfere with their L1 translations during picture-naming in L1

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When naming a picture (e.g., a table) in their native language (L1, e.g., English: "table"), early and late bilinguals name the picture faster when it is accompanied by the name's translation equivalent from their second language (L2, e.g., Spanish: "mesa"), compared to an unrelated word (e.g., "jamon" [ham]). Because both words refer to the identical concept, the effect is considered to reflect semantic facilitation via the secondlanguage word "mesa". So far, it is unclear whether this effect also obtains when the L2 words have been learned shortly before the test. In the present study, participants learned novel names for 36 familiar objects over the course of four days in an associative-learning procedure. These words were subsequently used as auditory (identical or unrelated) distractors in a picture-word interference task. Contrary to the facilitationobserved in bilinguals, who acquired their second language long ago, we found that the novel identical distractors led to interference when naming was in L1. In contrast, when the pictures had to be named with their novel names and the L1 translations were used as distractors, no such interference was observed. In both naming languages, within-language identity distractors (e.g., distractor "Auto", target name: "Auto") expectably led to large facilitation effects. In event-related potentials (ERPs), the difference between identical and unrelated distractors was reflected in N400-like effects in all conditions, except in the critical one that showed behavioral interference. The results are discussed in relation to models of novel-word learning and of language production.

Oral Presentation

Effects of bilingual experience and biliteracy on executive functions and working memory in Greek-Albanian children

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A bilingual advantage has been proposed, attributed to the bilinguals' need to focus attention on linguistic elements of the target language, while inhibiting interference from the non-target one, and constantly switching between two languages in relation to the task at hand. Less is known regarding the effects of bilingualism on the concurrent storage and processing of information in working memory (WM), as well as on the ability to update WM contents. In contrast to previous studies, where socio-economic status, bilingual educational background and languages spoken weren't taken into consideration, we studied the above functions in bilinguals 8-12 years, speaking Greek and Albanian. Participants were (1) monoliterate (N = 65, attending Greek school only) and (2) biliterate (N = 78, attending Albanian Sunday school, too). Bilinguals were compared with Greek monolinguals (N = 79) of similar working class background on (a) non-verbal intelligence, (b) processing speed, (c) executive functions (inhibitory control, switching, and updating), and (d) concurrent storage and processing of verbal and visuo-spatial information in WM. A bilingual advantage on the executive function tasks was expected, based on the existing literature. Analyses of variance showed that age didn't interact with bilingual experience in affecting cognitive task performance. Despite their lower performance on the non-verbal intelligence and speed of processing tasks (that remained significant even after controlling for non-verbal intelligence), both bilingual groups performed similarly to monolinguals on the switching and the visuo-spatial WM tasks. Monolinguals performed higher than monoliterate bilinguals only on the verbal WM and the updating measures; differences turned insignificant when controlling for non-verbal intelligence, though. Interestingly, the biliterate bilingual group outperformed the monoliterate bilinguals on the inhibitory control measure. These findings could be attributed to the bilingual advantage suggested, which, however, seems to depend on the investigation context (linguistic, educational, social, and also on measures employed).

Oral Presentation

Cross-linguistic exposure triggers changes in parsing preferences

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Bilinguals' sentence processing can reflect a blend of parsing strategies from both of their languages (Dussias & Sagarra, 2007), but does this represent a stable aspect of their processing, or is the degree of crosslinguistic influence malleable? If the parser's configuration is related to language exposure (Gennari & MacDonald, 2009), bilinguals' processing preferences are expected to change as a function of the frequency with which the relevant structure appears in the environment. We investigated this in the context of syntactically ambiguous relative clauses as in (1)Arrestaron a la hermana del hombre que estaba enferma. Someone arrested the sisterFEM of the man who was illFEM. The relative clause, que estaba enferma ('who was ill') is temporarily ambiguous because it could potentially modify the higher noun (hermana, 'sister') or the lower noun (hombre, 'man'). Because enferma ('ill') is marked with feminine gender, it effectively forces "high attachment," so the relative clause is ultimately interpreted as referring to hermana. 54 proficient Spanish-English bilinguals were recruited. Phase 1, eye tracking assessed whether participants initially preferred high- or low-attachment resolutions when reading Spanish. Phase 2, participants completed a 5-day 'treatment', exposing them to 120 relative clause constructions favoring the opposite attachment parse to their initial preference. Participants were randomly assigned to receive the treatment in their L1 Spanish or L2 English to examine whether exposure to the L2 could influence the L1. Phase 3, eye movement records were collected immediately after the treatment and one week later. Following training, participants' parsing preferences changed reliably, consistent with the training condition. There was only scant evidence for a role of the language the training was presented in. Thus, we find evidence for experience-based, language-independent shifts in parsing strategies, supporting usage-based models of sentence comprehension (MacDonald & Seidenberg, 2006).

Oral Presentation

15:20 - 15:40 | Lara A - B

Performing iconic gestures during learning accelerates vocabulary acquisition in a foreign language

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In the current study we evaluated whether the production of iconic gestures facilitated the acquisition of vocabulary in a foreign language. To this end, monolingual participants of Spanish were required to learn novel words in an artificial language during three consecutive days. The participants produced the novel words (i.e., "kudi", meaning "match" in the artificial language) at the time they performed a congruent iconic gesture (the act of lightening a match) an incongruent gesture (e.g., the act of playing the flute) and a meaningless gesture. After each day of training, participants translated the words from Spanish to the artificial language and vice versa. Compared to the learning of words without gestures, the production of congruent gestures accelerated vocabulary acquisition across the training sessions. However, the production of incongruent and meaningless gestures slowed down language learning relative to the training without gestures. These results suggest that performing iconic gestures facilitates or interferes vocabulary learning depending on the match between the meanings associated to the gestures and the linguistic words.

Oral Presentation

15:40 - 16:00 | Lara A - B

Hebrew morphological knowledge in Russian-Hebrew bilingual children: The insidious role of vocabulary

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Bilingual children receive less input in each of their languages than do children exposed to a single language, and thus usually have smaller vocabularies in each of their languages, compared to monolingual peers. Fewer studies have compared morphological knowledge between monolinguals and bilinguals. Studies conducted with English speaking children have reported mixed results, some finding reduced morphological knowledge in bilingual children and others reporting no group differences. The current study focused on Hebrew monolingual and Russian-Hebrew bilingual Israeli children in the 5th grade, who had been educated exclusively in Hebrew since age 5 up until the time of study. Monolingual and bilinguals children were recruited from the same classrooms, and were matched on intelligence, parental education and SES. As expected, bilingual children had significantly lower vocabulary knowledge in Hebrew than monolingual peers, due to reduced exposure to the language outside of school. Morphological knowledge was examined extensively using four tasks, differing in their reliance on linguistic and vocabulary knowledge in Hebrew. Two of the tasks probed morphological knowledge by using Hebrew pseudo-words, and thus did not rely on vocabulary knowledge. In these tasks bilingual and monolingual children performed equally well, demonstrating comparable levels of abstract morphological knowledge. Two additional tasks probed morphological knowledge by using actual Hebrew words, thus relying on vocabulary and linguistic knowledge as well. In these tasks, monolingual children outperformed their bilingual peers. The results suggest that the reduced input that bilingual children receive is nevertheless sufficient for abstracting the morphological structure of Hebrew words. The findings also reinforce vocabulary knowledge as a main locus of linguistic gaps between monolingual and bilingual children. These patterns have implications for theories of language learning, and the interplay between morphology and vocabulary knowledge.

Oral Presentation

14:20 – 14:40 | Amoroza A

A sensorimotor approach of social cognition

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Through a series of experiments performed in dyads and relying on motion capture recordings, we investigated how the social scope of intentions and desires are grounded in the interaction between our motor abilities and the environment. In the first place, we'll show how the social context subtly influences the execution of objectoriented motor actions. In particular, we observed that object-oriented movements are executed more slowly and in a more curved way when the aim is to displace an object for a partner rather than for the actor herself. We have interpreted these kinematic effects as implicit communicative information emerging through voluntary movement to catch the partner's attention and optimize cooperation. In order to test this hypothesis, we conducted a second study where we manipulated unnoticeably the partner's eye level through the use of an adjustable seat. Results showed that the actors exaggerated unconsciously the trajectory curvature in relation to the partner's eye level, suggesting that other bodies' characteristics are implicitly taken into account when we behave in a social context. Yet, it is still unknown whether individuals spontaneously perceive these informative social cues borne by action and if it is possible to benefit from them. In order to examine this issue, we conducted a third study, using an original perceptivo-motor task. We found that naive observers can implicitly take advantage from these kinematics effects for their own motor productions. This study provided the first evidence of a spontaneous perception of social intention in observed motor actions and also suggested an implicit cognitive processing of the social scope of other's action during social interaction. Considered together, these data support that our ability to predict others' actions and ascribe intention and mental states to others is highly linked to sensorimotricity and grounded in the interactions between our body and the social environment.

Oral Presentation

The role of the dorsomedial prefrontal cortex in forming and updating social impressions

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Several neuroimaging studies point to a key role of the dorsomedial prefrontal cortex (dmPFC) in the formation of socially relevant impressions. In different experiments, participants were required to form socially relevant impressions about other individuals on the basis of text descriptions of their social behaviors. Before deciding whether an adjective expressing a personality trait matched the impression they had previously formed, participants received transcranial magnetic stimulation (TMS) over the dmPFC, the inferior frontal gyrus (IFG) and over the Vertex (control site). Results converged in showing that interfering with dmPFC (but not IFG) activity significantly delayed participants in responding whether a trait described the impression they had formed. In an additional TMS experiment, we investigated the involvement of the dmPFC in both creation and updating of social impressions. Our preliminary data suggest that suppressing activity in the dmPFC affects the way individuals deal with inconsistent information about others' social conducts.

Oral Presentation

15:00 – 15:20 | Amoroza A

Pupil-Mimicry Correlates with Trust in In-Group Partners with Dilating Pupils

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During close interactions with fellow group members, humans look into another's eyes, follow gaze and quickly grasp emotion signals. The eye-catching morphology of human eyes with unique eye-white draws attention to the middle part, to the pupils and autonomic changes therein, that signal arousal, cognitive load and (social) interest. Here we examine whether and how these changes in partner's pupils are processed and impact on the partner's trustworthiness. Participants played incentivized trust games with virtual partners, whose eyeregion had dilating, static, or constricting pupils. Results show that (i) participants trusted partners with dilating pupils and withheld trust from partners with constricting pupils (ii) participant's pupils mimicked changes in their partner's pupils, (iii) dilation-mimicry predicted trust in in-group-partners, while constriction-mimicry did not. We suggest that pupil-contingent trust is in-group bounded and possibly evolved in and because of group life.

Oral Presentation

15:20 - 15:40 | Amoroza A

Doing the dirty work: influence of coercion on the sense of agency

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In the so-called Nuremberg defence, people claimed they were not responsible for their despicable actions because they were only ≪ obeying orders ≫. In the famous experiments of Stanley Milgram (1963, 1974), experimenters persuaded participants to inflict allegedly painful (and deadly) electric shocks on a third party. These classic studies suggested that people comply with coercive orders, but the subjective experience of participants in such situations has not been systematically explored. Does being ordered to perform an action actually reduce one's feeling of responsibility for the outcome compared to willed intentional actions? Does this effect depend on whether the outcome has undesirable effects on others or not? In a first experiment, 42 female participants were tested in pairs. In a free condition, participants were told that they could freely choose to take or not to take money from the other participant. In the coercive condition, the experimenter ordered the agent to take money to the other participant. Both the agent and the victim judged temporal delays between the agent's key press and a neutral tone (i.e. intentional binding paradigm). Crucially, intervals estimates for agents were shorter in the free condition than in the coercive cognition, suggesting that coercion actually reduces the sense of agency. This difference was not significant for victims. In a second experiment, the procedure was globally similar but this time, agents had to deliver a genuine and moderately painful electric shock to the victim in order to earn more money (they both started with £ 15). As in Experiment 1, coercion reduced agency for the agent, but this time, coercion also reduced agency for the victim. Results and their implications for understanding the sense of agency are discussed in light of the Milgram experiment.

Oral Presentation

15:40 - 16:00 | Amoroza A

How reduced information can increase cooperation in groups

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Cooperation is a fundamental pillar of our society. Merging our resources makes us stronger and enables us to enjoy benefits that we wouldn't have otherwise. However, people are sometimes able to benefit from others' cooperation without actually contributing themselves. For example, someone might be tempted to cheat on tax forms and not sufficiently contribute to public expenses, while still enjoying their perks. As cooperation is vital for our society, we examine means to increase people's willingness to cooperate in our research. In the present study, we introduce results from a cooperation game that 14 to 20 people played together online as a group. In this game, zombies attacked the group and players had to make individual decisions between hiding and fighting in each of 120 rounds. Fighting created points for everyone in the group while hiding only created a relative advantage for the individual player. Hence, people had to decide whether to cooperate and create profits for the group by fighting or to exploit the profits created by others while hiding. Previous research showed that people often refrain from cooperation when they feel disadvantaged compared to others. Therefore, we tested two conditions, where in one of them, players only saw the points that they received and in the other, they could also see everyone else's points. We examined ten groups in each condition and observed that people were more cooperative when they only saw their own earnings and didn't think as much about potentially missed points. Subjects' statements suggested that when they could only see their own points, they were not so focused on the points they could have gotten from hiding but felt better about fightingto increase the groups' performance.

Oral Presentation

Are idiomatic expressions more emotionally engaging than literal statements? An fMRI study

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While neuroscientific research has extensively shown that the emotional content of words affects literal language comprehension, far less is known about the emotional impact of non-literal language. In this eventrelated fMRI study, we explored the hypothesis that familiar idioms may have a broader affective impact than literal statements (LSs). 18 participants silently read for comprehension positive, negative and emotion-neutral literal and idiomatic sentences (matched for length, familiarity, concreteness, emotional valence and arousal). We expected affect-related brain regions to show enhanced activation in response to emotional idioms than neutral idioms and, in line with evidence on metaphors, to idioms overall than LSs. Furthermore, we expected enhanced bilateral activation of the IFG in response to idioms than to LSs. Results showed bilateral enhanced activation of the IFG, the right pre-central gyrus and left amygdala for idioms compared to LSs. This may reflect higher cognitive processing demands of idioms, in line with some prior fMRI and EEG studies. In addition, idioms were more emotionally engaging than LSs. We also observed enhanced activation of the left pre- and post-central gyri and right superior temporal gyrus in response to emotional compared to neutral idioms. Emotional and emotion-neutral idioms did not differently engage affective regions but rather differed in how much sensory-motor cortices and semantic processing areas were recruited. The lack of significant differences between emotional and neutral LSs suggests that idioms may be more salient at a neural level than LSs. In addition, a functional connectivity analysis with left and right IFG, and right pre-post-central gyrus as seed regions showed that increased activation of the left IFG was associated with increased activation of left amygdala. This suggests involvement of executive functions in selecting the figurative interpretation of the idiom string that in turn triggers a feeling of insight and the detection of salience.

Oral Presentation

The consequences of a mind that wanders early on while reading and listening

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In two experiments, we investigated how mind wandering impacted different levels of text representation. Participants were required to read (Experiment 1) or listen (Experiment 2) to texts in order to complete a sentence verification task. Both the reading and listening of texts were interrupted twice: once after a short period of time had been spent on the task (i.e., early interruption), and once after a longer period (i.e., late interruption). In order to probe awareness of mind wandering, participants were asked whether they were focused on the text at the moment an interruption occurred. They subsequently performed the sentence verification task in which they were required to tell whether each of three sentences was presented in the text that preceded the interruption. These sentences were of three types, in order to assess three levels of representation: old verbatim sentences that probed lexical levels, paraphrases that probed semantic levels, and inferential sentences that probed the situation model level. The results of both experiments show that the presence of mind wandering at the moment an interruption occurred mostly altered recognition of old verbatim sentences. However, whilst participants reported being more frequently engaged in mind wandering after late interruptions, the most deleterious effects of mind wandering on old verbatim sentences were observed after early interruptions. We discuss the cognitive processes that might be affected by mind wandering for such a specific effect to be observed.

Oral Presentation

How is Rapid Automatized Naming related to reading? A behavioral and event-related potential study with children

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Several factors have been related to reading abilities, such as phonological awareness and rapid automatized naming (RAN). Performances in RAN tasks are differently related to reading depending on its formats (i.e., discrete, with items displayed one by one on a computer screen; and serial, with items arranged in arrows on a sheet; deJong, 2011). Moreover the cognitive processes underlying the RAN-reading relationship are still debated. To date, two main hypotheses dominate the literature: the first is related to a common visual underpinning of reading and RAN while the second suggests common underlying phonological processes (deJong, 2012). While previous studies have attempted to disentangle these two explanations of the RANreading relationship using behavioral approaches, here we will combine behavioral and ERP data to investigate the question by means of the temporal course of the RAN-reading relationship. Thirty-one French speaking children, 9 to 10 years-old took part to the experiment. Participants performed two discrete RAN tasks (with letters and pictures) under EEG recording. They also performed a set of behavioral tasks: serial letters and pictures RAN (with the same items as in the discrete one), text reading, word list reading and discrete word reading (with items displayed one by one).The behavioral results showed significant correlations between the discrete RAN tasks and discrete reading skills in terms of accuracy and latency. We therefore analyzed the time course of correlations between reading skills and several parameters (amplitude waveforms, GFP, periods of stable electrophysiological activity) of the ERPs locked to the onset of the RAN stimuli (picture or letter). Correlations were observed for both RAN tasks in a late time-window, starting around 340 ms after stimulus onset, i.e. beyond the P1-N2 complex. This time-window has been associated with lexical and phonological processes in picture naming. These results thus rather support the phonological RAN-reading relationship.

Oral Presentation

Competing talker interference in sentence comprehension

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In everyday environments (for example in a cocktail party situation), we often have to attend to one person's speech (target speech) while ignoring another (competing speech). A competing talker can impair speech processing through both energetic masking (acoustic degradation at the periphery) and informational, cognitive aspects of the mask. We refer to the latter as informational interference. We hypothesized that informational interference depletes processing resources that could otherwise be allocated to recognizing and understanding target speech. Consequently, informational interference should be more pronounced for target sentences with high processing demands (complex syntactic structure) than for sentences with low processing demands (simpler syntactic strcucture). Furthermore, informational interference should be particularly marked when participants' own processing demands are elevated, as with non-native listeners. Using a speeded picture-selection task, we assessed native and non-native listeners' understanding of subject-relative (simple) and object-relative (complex) spoken sentences, played against a competing talker vs. a matched energetic mask, at various signal-to-noise ratios (SNRs). Although the object-relative sentences were responded to more slowly than the subject-relative sentences, the competing talker did not affect performance more than did energetic mask controls. This pattern was comparable for native and non-native listeners, and across SNRs. Moreover, individual differences in working memory were not related to differences in the speeded-selection task, regardless of the mask. Eye-tracking and pupillometric versions of this experiment also yielded similar results. Thus, contrary to prior research, we found no evidence that a competing talker requires greater processing resources than energetic masking alone. To address this discrepancy, an ongoing study aims to determine whether the semantic content of the competing talker's utterances modulates attention to the target.

Oral Presentation

Eye movements reveal memory processes during hypotheses testing in sequential diagnostic reasoning

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Tracking memory processes involved in complex cognitive tasks such as reasoning, thinking and decision making proves difficult because they proceed without accompanying actions towards the environment. Memory indexing is a novel method to study the time course of information processing in memory during higher level cognitive tasks by recording eye movements (Jahn & Braatz, 2014; Cognitive Psychology, 68; Renkewitz & Jahn, 2012, Journal of Experimental Psychology: Learning, Memory, and Cognition, 38; Scholz, von Helversen, & Rieskamp, 2015; Cognition, 136). The basic principle underlying memory indexing is that people look at an emptied spatial location when retrieving information that has been associated with the spatial location during encoding (e.g., Richardson & Spivey, 2000, Cognition, 76; Scholz, Mehlhorn, & Krems, 2015; Psychological Research). We demonstrate how memory indexing can reveal memory dynamics in sequential diagnostic reasoning during which multiple pieces of information have to be combined to find a best explanation for a given set of observed symptoms (e.g. Johnson & Krems, 2001, Cognitive Science, 25). In an experimental study, participants first learned information about causes and symptoms presented in spatial frames on a computer screen. During reasoning, they only saw the emptied spatial frames without symptom information. Gaze allocation during sequential symptom presentation and during the diagnostic response revealed the diagnostic value of the first symptom, subsequent symptom integration, the set of contending hypotheses, hypothesis change, and symptom rehearsal. Looking at "nothing" demonstrates the tight interplay between memory processes engaged in abstract mental operations with sensorimotor processing and affords rich information about cognitive processing in complex tasks such as sequential diagnostic reasoning.

Oral Presentation

Entrainment in the wild: Effects of multiple shared and private contexts on referential communication

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In this project, we aim to understand what constrains the variability in referring expressions that people spontaneously produce and interpret in conversation. People in conversation typically mark the belief that they've reached a conceptual pact by re-using the same (or a shortened) referring expression for a particular referent; this is lexical entrainment (Brennan & Clark, 1996) and has been demonstrated many times in the laboratory. However in real-world settings, there are many other influences on referring that are not shared between interlocutors. We staged a series of shared and private tasks for 36 pairs of interlocutors to examine the influence of multiple contexts and experiences upon referring. First, pairs did a collaborative navigation task in which a stationary partner (Giver) used a mobile phone to direct a pedestrian (Follower) to 18 target destinations over a ~1.8 mile route on the Stony Brook University campus. During this shared task, the Giver saw information (labels, pictures, a map) that the Follower did not, while the Follower walked to, discovered, and photographed these destinations. Upon returning to the lab, the Follower briefly discussed the destinations with a third speaker who sometimes used different expressions (than had the Giver) to refer to them. Individuals separately completed a test of spatial ability and a memory test for the locations, and the pairs reunited for 6 rounds of a referential communication task in which they matched copies of the photographs the Follower had taken of the destinations. Despite pairs' distinctive (and more recent) private experiences of competing contexts, they still entrained on referring expressions; moreover, the greatest influence on the forms of these expressions was their shared experience from the navigation task. Our experimentally parameterized Walking Around Corpus is available for studies of referring expressions and spatial language, as well as for applications to pedestrian navigation.

Oral Presentation

Effect of task constraints on the motor coding of peripersonal space

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Peripersonal (PS) and extrapersonal (ES) spaces are differentially represented within the visual brain. PS contains the objects that we can immediately reach and manipulate, and specifies our private area in a social context. Yet, it is not known whether objects in PS automatically activate the motor system, and how PS influences interpersonal distances in a social context. We performed a series of studies with the aim to evaluate whether (1) visual objects spontaneously involves the sensorimotor system when presented in PS, (2) the motor encoding of PS mediates the control of distances in a social context. In a first study, we recorded EEG event-related-desynchronization of μ rhythm on the centro-parietal region while judging the reachability or shape of visual objects presented at different distances in a virtual environment. Visual objects had either a prototypical or a distorted shape. Time-frequency analysis of EEG signals revealed that motor-related μ rhythm desynchronization started 315 ms after object presentation but only in the reachability judgment task and when objects were presented in PS with a prototypical shape. In a second study, we analyzed the relation between PS and interpersonal distance in social interactions, by measuring the feeling of comfort with approaching human-like point-light displays, while manipulating the size of PS. We found that comfortable interpersonal distance was predictable from the (modulated) size of PS. As a whole, the data support the embodied and situated nature of PS and reveals that PS is a key component of the regulation of social interactions.

Oral Presentation

Interpersonal integration of perceptual judgments in an object location task

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There has been a growing interest in the question of how different individuals can integrate perceptual information to maximize the quality of their decisions or judgments (Ernst, 2010; Yaniv, 2004). Several recent findings suggest that the opportunity to communicate one's confidence is necessary to obtain a group advantage when information available to group members is of unequal quality (Bahrami et al., 2010; Fusaroli et al., 2012). In the present study we asked whether there are alternative mechanisms that allow individuals to incorporate information from others that do not require communicating confidence. Participants were asked to match locations on the two planes of a virtual environment. Because individuals are more inaccurate in judging location from depth than judging location from orthogonal spatial dimension we could reliably manipulate the pattern of participants' uncertainty of judging object location on particular dimensions by varying the angle of the generated viewpoint. Participants conducted the task either alone or with a partner (joint condition). In the joint condition participants were allowed to revise their judgments after observing their partner's judgment made from a different viewpoint. The angle between the two partners' viewpoints was varied on three levels: 90°, 45°, and 0°. The revised judgments were more accurate in all three joint conditions compared to individual performance from one viewpoint. Crucially, individuals weighed the information from a partner on the two dimensions selectively, systematically discounting imprecise judgments. In two further experiments participants were provided with access to both viewpoints or performed the task jointly with a partner. Participants' location judgments were equally accurate in both conditions suggesting that combining information within- and cross-individually was equally effective. Together, our results demonstrated that participants incorporated location information provided by their partners by flexibly weighing location information on particular spatial dimensions according to their partners' uncertainties, and without verbal communication.

Oral Presentation

15:20 - 15:40 | Amoroza D

The effect of gesturing on navigation and spatial memory depends on individual differences in spatial ability

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Does producing gestures while studying routes facilitate navigation? Across two experiments, we examined whether the gestures produced while studying route directions facilitate navigation performance and the resulting memory representations for the environment.

In Experiment 1, thirty-six participants studied route descriptions, producing congruent gestures for one route and keeping their hands still for another. When participants had gestured, they made numerically more errors and took longer to navigate the route in a virtual environment than when they hadn't gestured. Despite this surprising decrement in navigation performance, gesturing did not impair memory, which was assessed through a pointing task and a model-building task. Instead, at least for one route, gesturing actually led to better memory, particularly for navigators with lower spatial ability scores. This dissociation between navigation and memory performance could be because recovering from navigation errors improved the navigators' final memory representation.

In Experiment 2, twenty-four participants studied the route directions without explicit instructions about gesturing, following otherwise an identical procedure. Through this experiment we intend to clarify the mechanism underlying the pernicious effect of gesturing on navigation performance observed in Experiment 1. If spontaneous gesturing facilitates navigation performance, the decrement observed in Experiment 1 could have been due to forced gestures taxing participants' cognitive resources. However, if spontaneous gesturing continues not to improve navigation performance, then gesturing may not be an ideal strategy for encoding routes in unfamiliar environments. This could be because accompanying discrete linguistic descriptions (e.g., "left turn"), which not capture gradient spatial relationships, with gestures may reinforce schematic and slightly inaccurate inferences (e.g., an expectation of a canonical 90° left turn) that can conflict one's perceptual experience during navigation.

So far, our findings suggest the effects of gesturing are selective, depending on the complexity of the described route, the navigators' spatial abilities, and their previous gesturing strategies.

Oral Presentation

Grammatical gender and participant sex interaction in lexical access and embodied perspective taking

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Processing of grammatical gender has been in the focus of numerous studies of lexical access examining word characteristics that produce differences in the speed and accuracy of processing single words, typically nouns, or modifier-noun phrases with matching or mismatching gender markers. Little work exists to date, however, on the effects of participant sex on grammatical gender processing. Here we review recent findings on the interaction of the grammatical gender of the words being processed (gender: masculine vs. feminine) and the biological sex of the participants (sex: male vs. female) in three kinds of experimental tasks. The gender-sex interaction was found for visually presented nouns in Bulgarian such that it reflects a bias toward one's own grammatical gender "counterpart" (especially for females) in a cued shadowing task and a gender monitoring task. These findings were extended in two further studies showing response latencies to be sensitive to gender-sex congruence in the auditory processing of verbs and adjectives, concerning the sex of the speaker's voice, in addition to effects of participant sex on accuracy and latencies. The last study examined how gendersex congruence affected the embodied processing of first-person sentences and of images with either an internal or an external perspective in a picture-sentence verification task. Participants did not discriminate between internal and external perspectives in the gender-sex congruent condition, allowing for an agentive interpretation by the reader. However, in the gender-sex incongruent condition, the effect of image perspective indicated large processing costs for attempting to adopt an internal perspective when the participant's sex was incompatible with the first-person gender marking, hence with action simulation from an egocentric perspective. These findings are discussed in terms of embodiment specificity accounts, individual differences and the experiential basis of grammar processing.

Poster Presentation

The objects of visuo-spatial short-term memory: Perceptual organisation and change detection

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Change detection paradigms focusing on estimating visuo-spatial short-term memory (VSSTM) capacity typically vary aspects relating to discrete item characteristics or set size, often overlooking the fact that stimuli are not encoded in isolation, but rather in a configural, object-oriented way. In addition, change detection measurements are often based on categorical same/different decisions, which may not be sensitive enough to detect certain effects. Here we used a colour change detection paradigm where participants were required to remember the colours of six equally-spaced circles, one of which could change colour between standard and test display. Memory items were superimposed on a background so as to perceptually group them either within i) an intact ring-shaped object, ii) a physically segmented but perceptually completed (via occlusion) ringshaped object, or iii) a corresponding background segmented into three arc-shaped objects. A brief visual cue at the location of one of the circles, which did not predict memory probe location, was followed by the six memory items, which in turn were followed by a test display containing a probe indicating the target circle to be judged same/different. Reaction times for correct responses revealed a same-object advantage such that probe locations were responded to faster if they lay on the same object as the cue compared to equidistant locations on a segmented object. This same-object advantage was identical for both physically and perceptually completed objects, but was only evident in reaction times, and not in accuracy measures. The results highlight the importance of object-level perceptual organisation of elements in visual displays when evaluating VSSTM, especially since many manipulations of interest (e.g., number and complexity of elements) are likely to influence such perceptual organisation. Moreover, we demonstrate that continuous measures, such as speed, may be more sensitive to the structure of VSSTM than categorical measures, such as same/different judgements.

Poster Presentation

'Mens sana in corpore sano': Cognitive functioning predicts race performance in ultra-marathon runners

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The present study was aimed at exploring the impact of cognitive functions on performance of ultra-marathon runners, providing an overview of the cognitive aspects that characterize outstanding runners. Thirty runners were administered a battery of computerized tests right before their participation in an ultramarathon. Then, they were split according to the race rank into two groups (i.e., faster runners vs. slower runners) and their cognitive performance was compared. Faster runners outperformed slower runners in trials requiring motor inhibition and were more effective at performing two tasks together, successfully suppressing the activation of the information for one of the tasks when was not relevant. In addition, as compared with slower runners, faster runners took less time to remember to execute pre-defined actions associated with emotional stimuli when such stimuli were presented. These findings suggest that cognitive and emotional factors may play a crucial role in running an ultramarathon. Indeed, if compared with slower runners, faster runners seem to have a better inhibitory control, showing superior ability not only to inhibit motor response but also to suppress processing of irrelevant information. Their cognitive performance also appears to be less influenced by the emotional content of the stimuli.

Poster Presentation **Session B**

Optimal experimental design for adaptive interventions in cognitive studies

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Experimental design plays a key role in cognitive studies to ensure optimal utilization of resources for drawing valid statistical inference on the objects of interest. We investigate the optimal design problem for adaptive interventions which have been of much recent interest due to their flexibility. We begin with a setup involving two factors each at two levels. Consider, for example, a study on attention deficit in children. With two treatments A and B representing two kinds of behavioral intervention, at the first stage of the experiment either A or B can be applied at low intensity. These constitute the levels of the first stage factor F. The second stage intervention is adaptive: for responders at the first stage, the same treatment continues at low intensity, while for non-responders, either (i) the intensity of the same treatment is enhanced or (ii) the other treatment is applied, with (i) and (ii) constituting the levels of the second stage factor G. The appropriately defined main effects of factors F and G along with their interaction are the parameters of interest. The design problem calls for optimal determination of (a) the proportions of experimental subjects to be assigned to the two levels of F at the first stage, as well as (b) for each level of F, the proportions of nonresponders to be assigned to the two levels of G at the second stage, so as to estimate these parameters most efficiently, taking due cognizance of the influence of covariates. We find a solution to this optimal design problem by first obtaining results on estimation efficiency and then using a minimaxity approach. Our results also enable us to evaluate the performance of the naive design with equal allocation at each stage. The possibility of extension to more complex experimental situations is discussed.

Poster Presentation   **Session B**

Reduced interhemispheric Stroop-like interference in childhood and ageing

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One of the most important structural changes that occur in the brain of both children and older people relates to the corpus callosum (CC), the largest neural pathway that connects the two cerebral hemispheres. The CC consists of around 200 million fibres that continue to myelinate during childhood until puberty and that endures a process of demyelination in aging. Hence, a primary question of interest is whether these changes in callosal myelination have functional consequences on interhemispheric communication. To investigate interhemispheric function in children and older people, 10 children (aged 7-8 years), 12 older adults (aged 61-82 years) and 20 control young adults (aged 18-23 years) were tested with a divided visual field Stoop-like task. In this modified version of the Stroop paradigm, a number of dots (2 or 3) were paired with either an incongruent or congruent Arabic digit ("2" or "3"). The stimuli were presented tachistoscopically with the two components either distributed across the two hemifields (bilateral presentation) or presented to a single visual half-field (unilateral presentation). The Stroop effect, the difference in reaction times between the incongruent and congruent trials, was not affected by stimulus presentation in the control group. However, for both children and older adults, the Stroop effect was significantly smaller for bilaterally-presented stimuli than for unilaterallypresented stimuli, indicating reduced interhemispheric interference in these groups. These findings suggest that age-related callosal thinning may have specific functional consequences likely due to a decrease in interhemispheric connectivity. In particular, the condition appears to affect the ability of one hemisphere to interfere with the operation of the other hemisphere.

Poster Presentation

Task-switching performance and hemispheric asymmetries: a resting-state EEG study

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In our daily life, we constantly exert sustained and phasic cognitive control processes to manage multiple competing task sets and rapidly switch between them. Increasing research efforts are attempting to unveil how the brain mediates these processes, highlighting the importance of prefrontal cortex (PFC). An intriguing question concerns the role of hemispheric asymmetries, and whether it may be generalized to different cognitive domains notoriously depending on lateralized processing. Another currently hot question concerns the underlying causes of the observed huge inter-individual variability in cognitive control abilities. Here we tackle these issues by investigating whether participants' hemispheric asymmetry in intrinsic brain dynamics can reflect differences in their phasic and/or sustained cognitive control abilities regardless of the cognitive domain. To this aim, we recorded participants' resting-state electroencephalographic activity and performed a source-based spectral analysis to assess their lateralized brain dynamics at rest. Moreover, we used three task-switching paradigms involving different cognitive domains to assess participants' domain-general phasic and sustained cognitive control abilities. By performing a series of correlations and an intersection analysis, we showed that participants with stronger left- and right-lateralized intrinsic brain activity in a PFC region were more able, respectively, to exert phasic and sustained cognitive control. We propose that the variability in participants' prefrontal hemispheric asymmetry in the intrinsic electrophysiological spectral profile would reflect individual differences in preferentially engaging either the left-lateralized, phasic or the right-lateralized, sustained cognitive control processes to regulate their behavior in response to changing task demands, regardless of the specific cognitive domain involved. (Funding: ERC Starting Grant LEX-MEA GA #313692)

Poster Presentation   **Session B**

Impact of instructions and presentation rate on visual statistical learning

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Arciuli et al. (2014) recently argued that prior knowledge of the existence of statistical regularities in a sequence of shapes would increase learning of these regularities exclusively in situations allowing the involvement of strategies, namely with long presentation rates. The aim of the present study was (1) to test this assumption directly by investigating how learning condition (incidental vs. intentional) and presentation rate (fast vs. moderate) affect participants' knowledge of the regularities and (2) to examine how these factors influence the conscious vs. unconscious nature of the acquired knowledge. We exposed participants to four triplets (i.e. groups of three shapes presented sequentially) and assessed their degree of learning in a subsequent completion task integrating confidence judgments. Replicating previous results (Bertels et al., 2012), we observed that participants acquired both implicit and explicit knowledge of the triplets, even under incidental learning conditions and at fast presentation rates. Supporting Arciuli et al.'s claim, participants' performance benefited from intentional learning only at moderate presentation rates. Moreover, informing participants about the presence of regularities in the stream beforehand increased their explicit knowledge of the sequences, an effect that was not modulated by presentation speed. These results thus support that although visual statistical learning can take place incidentally and, at least to some extent, outside conscious awareness, factors such as moderate presentation speed and prior knowledge of the presence of statistical regularities in the stream can boost learning of these regularities, presumably by favoring the acquisition of explicit knowledge.

Poster Presentation

The role of attention in emotional memory enhancement in pathological and healthy aging

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In healthy participants, after a short delay between encoding and retrieval, memory performance is better for both negative and positive stimuli, than for neutral stimuli. Divided attention paradigms suggest that in healthy young participants this emotional enhancement of memory (EEM) is due to different attention mechanisms involved during encoding, namely: automatic processing for negative stimuli, and controlled processing for positive stimuli. Moreover, along with attention, organization and primary distinctiveness may also be involved in EEM. As far as we know, no systematic study on the influence of these factors on EEM in patients suffering from Alzheimer's disease (AD), and mild cognitive impairment (MCI), as compared to healthy young and older controls were conducted. Thus, the goal of the present study was to ascertain whether the EEM in AD and MCI patients, as well as in normal older participants with and without memory complaints, depends on the attention resources available at the time of encoding. Therefore, six groups of participants (AD and MCI patients, one group of healthy older participants with memory complaints, two groups of healthy older participants without memory complaints and a group of healthy young participants) completed two incidental encoding phases: full attention (FA) and divided attention (DA), followed by two retrieval phases (recognition tasks). Our results showed EEM for negative and positive stimuli only in healthy young participants, regardless of the type of encoding used (FA or DA). On the contrary, AD and MCI patients, and healthy older participants (with or without memory complaints) had better recognition scores after the FA encoding than after the DA encoding (showing successful manipulation of attention), but no EEM was observed. Our results favor the suggestion that to observe EEM in AD and MCI patients and in healthy older participants it is necessary to provide sufficiently deep and controlled encoding conditions.

Poster Presentation

Mechanisms of selective attention in Visual Working Memory: Distributing Attention in Mental and Physical Space

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Selective attention is not limited to physical information in the external world, but it can also be employed on mental representations in the internal world. It has been shown that shifting attention in the mental space shows similar behavioural characteristics as shifting attention in the physical space. However, it is not known whether mechanisms by which spatial attention prioritizes processing of physical information at locations that are in the focus of attention also apply to mental representations. We developed a variant of the retro-/precueing paradigm to investigate the characteristics of the distribution of spatial attention in mental space and directly compare them to attentional selection in physical space. A delayed match-to-sample task was administered where participants viewed a stimulus array of coloured discs which they had to memorize in order to make a delayed decision about a probe. A cue was either presented before (pre-cue) or after (retrocue) the stimulus array in order to orient attention to locations in physical or mental space. Participants were asked to decide whether the probe which occupied one of the positions of the stimulus array matched the stimulus array. We studied the distribution of attention by varying the distance between the focus of attention and the probe. In accordance with findings in spatial attention to perceptual stimuli, key characteristics of the distribution of spatial attention were observed in the mental space. Results will be discussed in more detail and theoretical implications will be highlighted.

Poster Presentation

Salience-based progression of attention: lower left quadrant amodal dominance in the motion dimension

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Motion attracts attention, and attention progresses through the visual field (VF) in a salience-based fashion. Yet little is known on how attention progresses in search of a motion signal among others, and whether such a progression can also be based on salience. Studies from different domains also suggest that there are different processing channels for different kinds of motion and some findings suggest that there might also be a dominance of the lower VF or the left VF independently of motion-type. Here, two experiments using adaptations of the Multiple Salience Level Visual Search Task were conducted. Participants had to report the orientation of a target presented among two distractors. At each new trial, the three items were animated by the same motion (translation, looming, or flicker) but each one at a different frequency (5Hz, 15Hz, 30Hz). The search display was presented for 100ms either on the left or the right of fixation in a random order, in a way to span the visual quadrants across trials. It was expected that performance progresses as a function of motion frequency of the target compared to the distractors (i.e., salience). Progression slopes showed that this was indeed the case. In agreement with the existence of different motion processing pathways, progression slopes were not the same for all motion types. We also found that, independently from motion type, progression slopes were different in the lower left VF. This is in agreement with the idea that the right occipito-parietal areas are mostly involved in the salience-based progression of attention through space in search of motion signals. The results confirm that (i) different motion signals are processed differently, that (ii) salience guides attention in search of a motion signal among others, and that (iii) this is an amodal effect mostly underlain by right occipito-parietal circuits.

Poster Presentation   **Session B**

Enhanced practice effects in task switching following transcranial direct current stimulation

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Our daily life often require us to switch between mind-sets, for example when stopping writing an email in order to start a conversation or pausing a video game in order to start making dinner. In order to investigate the processes that are involved in set shifting, researchers often use the task-switching paradigm. Given its prevalent in many cognitive tasks, improving task switching can affect various aspects of our lives. Till today, only traditional techniques were used to examine the course of practice on task switching paradigm. In the current study, we combined traditional and contemporary methods including transcranial direct current stimulation (tDCS) in order to enhance task switching practice effect. Participants took part in a three sessions experiment, in which they received a bilateral tDCS to the dorsolateral prefrontal cortex (DLPFC), in a between subjects design. In each session, they performed a well-established task-switching paradigm where they were required to switch between judgment rules according to an external cue. Results showed that stimulation to the left DLPFC speeded task acquisition and generated the best task switching performance compare with right anodal stimulation or Sham. This successful stimulation montage might be highly relevant in developing joint training paradigms in which traditional methods and brain stimulation play a common role in order to maximize cognitive enhancement.

Poster Presentation

Cognitive control in Indonesian and Dutch multimedia multitaskers: A replication study

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The act of consuming several streams of media simultaneously has become ubiquitous due to the increasing availability of multimedia devices. This behavior, known as multimedia multitasking, was recently shown to be related to impairment in cognitive control and selective attention (Ophir, Nass, & Wagner, PNAS 2009). This study aims to replicate the original findings among Indonesian and Dutch participants. A total of 11 High Multimedia Multitaskers (HMMs) and 12 Low Multimedia Multitaskers (LMMs) were selected from 154 Indonesian participants who filled in the Multimedia Use Questionnaire. Like the original study, HMMs in this group showed impairment in task-switching. But unlike the original study, both groups showed similar performance in tests of selective attention and working memory. This effect might be due to the Indonesian sample having a higher multimedia use in general, with the impairment in task-switching being the most robust difference among low and high multitaskers. In a follow-up replication attempt, we will use a Dutch sample that is comparable in terms of multimedia use with the original study and several other replication attempts. Accordingly, we hypothesize that we will replicate the full pattern of results from Ophir et al.'s study in Dutch sample.

Poster Presentation

How to stop and change a response: An ERP investigation

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Flexible and goal-directed behavior requires a cognitive control system that replaces actions in response to changes in the environment. We recently argued that various forms of action control involve perceptual, decisional, and motor-related processes to be successful (Verbruggen et al., 2014). The present study examined the relative contribution of these processes in a novel variant of the stop-change paradigm. Our task allowed a clean assessment of activity related to signal detection without contamination of overlapping activity from the immediately preceding go stimulus. In Experiment 1, on a quarter of the trials, a signal appeared on the left or right of fixation, instructing subjects to cancel the planned manual go response and execute a foot response instead. Lateralized signal presentation elicited a lateralized N1, P2 and N2pc. These components peaked earlier for fast change trials than for slow change trials, highlighting the importance of signal detection for successful stop-change performance. Furthermore, we observed the same components in a stop-only control condition, demonstrating the generality of the attentional mechanisms. In Experiment 2, the stopchange signal was presented in the center of the screen, reducing the signal detection demands. The fast-slow analysis of stop-change trials revealed no latency differences in early perceptual components, but a large delay of the P3 for slow trials. This suggests that between-trial differences were primarily due to variations at the response-selection stage in this experiment. Combined, these experiments indicate that many processes contribute to successfully stopping and replacing an action. I will discuss implications for the wider stop-signal and action control literatures.

Poster Presentation   **Session B**

The impact of emotional stimuli in biasing attentional selection during visual search in natural scenes

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Previous literature demonstrated that emotionally-arousing stimuli tend to capture automatically attentional resources. However, the impact of task-irrelevant emotionally-arousing stimuli in "grabbing" attention is still largely unexplored. The aim of the present study is to investigate at both behavioral and neural (fMRI) level the impact of emotional stimuli in biasing attention selection under different conditions of task-relevancy. We used a visual search task involving complex natural scenes (implying a high-level of competition among objects), in which positive and negative emotional items were in a task-relevant vs. irrelevant position (i.e., they were or they were not the current target to be searched for). When emotional items were task-irrelevant, subjects were asked to search for a neutral object in the scene. At a behavioural level we found faster detection of taskrelevant emotional objects as compared to neutral objects (i.e., in the presence of task-irrelevant emotional distracters). fMRI analysis revealed that scenes including negative objects, irrespectively to their taskrelevance, produced activation of insula, a well-known area involved with emotional processing. By contrast, task-irrelevant emotional distracters, irrespective of the valence, produced activation along the dorsal frontoparietal (dFP) attention network. This indicates an effort in disengaging attention from emotional task-irrelevant objects and re-orienting attention to the rest of the scene. Overall, these findings suggest that emotional elements in complex scenes, irrespective of valence, capture attention and affect attentional selection by diverting processing resource from other – neutral – elements in the scene. Top-down attention control (i.e., highlighted by the activation of dFP network) needs to be engaged to overcome emotional distraction.

Poster Presentation

The efficiency of attentional networks and Susceptibility to orientation illusions

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This study examined cognitive determinants of susceptibility to experiencing orientation illusions: Poggendorff, Zöllner, Ponzo and Rod and Frame Illusion. It was assumed that alerting and orienting attentional networks may affect more susceptibility to illusions than executive attention. Moreover women were considered to be more susceptible to illusions. 51 high school students (29 women, 22 men) aged 23,5 +/- 1,5, were tested with The Attentional Network Test. Susceptibility to visual illusions was verified with series of computer tasks Visual Illusions Simulation (VIS). There was no effect of attentional networks on susceptibility to orientation illusions. It appeared that gender differentiated the efficiency of ANT alerting in the way that women exhibited greater vigilance of visual attention than men. High alertness enhanced resistance to Zollner and Ponzo illusions only in men. The results showed that men with less efficient alerting network were more prone to visual illusions. We assume that weaker alerting is associated with a lower VWM capacity.

Poster Presentation

Bayesian modeling of visual attention in word recognition: simulating optimal viewing position

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In the literature, computational models of reading aloud are typically distinct from word recognition models. The former focus on high level phonological (and semantic) processes to explain how pronunciation is computed from a complete and perfectly identified sequence of letters; the latter focus on the orthographic processing stage and mainly address letter order encoding issues. None of these models includes any computational visual attention component. Based on recent behavioural and neuro-imaging evidence that visual attention span contributes to letter string processing, we develop the first model of word recognition that incorporates visual attention as a key processing device. Another originality of the model relies on the use of probabilistic programming methodologies, coming from robotics and artificial intelligence, to define modular structures in a Bayesian framework. The result is a dynamic Bayesian word recognition model, integrating bottom-up visual identification of letters and lateral interference between visual inputs with top-down control of attentional resources and lexical knowledge. (We call the model BRAID, for Bayesian Reading with Attention, Interference and Dynamics.) In a series of stimulations, we first show how visual attention modulates letter identification and letter position encoding. We will report simulations of classical effects of frequency, word superiority, priming or letter transposition. BRAID further allows simulating more challenging behavioural data such as the optimal viewing position effect, due to the possibility to focus attention on different letters of the input word.

Poster Presentation

Examining the role of executive functions in learning from hypertext

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Executive functions (EFs) are a set of abilities used in everyday learning situations. Given the demands of digital learning environments, it has been suggested that heightened EFs might underlie effective learning. For instance, selection of relevant links from a search list often requires inhibition of key-presses to less relevant links. Sometimes, deciding on relevance is difficult because a link's title and brief description present conflicting information. Here we investigated the relationship between EFs, link selection in a conflict situation and study outcomes. In addition, based upon findings of superior EFs among bilinguals relative to monolinguals, we tested the prediction that fluent bilinguals would be better at link selection in a conflict situation. The participants were 38 monolingual Hebrew speakers and 38 highly proficient bilinguals (second language Hebrew). EFs were assessed with a task-switching paradigm. In the learning task, there was a limited time to select relevant links and study about the Gothic style. Participants accessed webpages from a pre-generated search list (20 items), in which half of the links contained conflicting information. Participants completed a pre- and post-test on the study topic to assess learning. The results showed successful learning in the hypertext environment, but there were no group differences in study outcomes. The bilingual participants, however, did select more relevant links in the conflict condition relative to monolinguals, and they reported less disorientation during learning. Regarding the assessment of EFs, there were significant effects of mixing-cost, switch-cost and a preparation effect, but there was no interaction of these effects with group. Therefore, correlations among dependent variables were examined across all participants. Perceived disorientation during learning was significantly correlated with link selection, mixing-cost and conflict resolution in the task-switching paradigm. Future studies are needed to further delineate the relationship between EFs and various aspects of digital learning.

Poster Presentation   Session B

The influence of goal orientation and attention control on retrieval-induced forgetting (RIF)

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The aim of this study was to deepen the knowledge on the role of attention control and goal orientation in retrieval-induced forgetting (RIF). The study was experimental (N=113). Participants were divided into three groups. In each of the conditions a standard RIF procedure was applied (phases: study, practice, distraction and recall) with an additional measurement of implicit evaluation conducted before the final phase of the experiment. Through the use of instruction, attention was directed either on the material processed during the practice phase or on the whole studied material. The measure of the RIF effect was the difference between the level of recall of exemplars from the unpracticed category (NRP) and recall of unpracticed exemplars from practiced categories (RP-). Additionally, attention was measured by the Attention Control Scale (Derryberry and Reed, 2002; Polish version: Fajkowska and Derryberry, 2012) and the Affective Priming Task (Fazio, 2001) was used in order to examine implicit evaluation. In the first two groups a negative correlation between the implicit evaluation of stimuli from the unpracticed category and RIF effect was demonstrated. In the third group, there was no such relation, but the RIF effect was stronger. In this case, the negative correlation indicates inhibition of the current task nonfunctional elements. The results suggest that one of the causes of RIF is attention orientation on distant target, rather than rebounding elicited by negative evaluation of NRP.

Poster Presentation

Eye movements reveal links between attentional biases to threat and friendship quality in 9-11-year-olds with internalising and externalising personality traits

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We tested the idea that the association between temperamental risk and poor peer relationships could result from anxious and aggressive individuals' difficulty to inhibit threat. We measured the ability of a group of 9-11 year-old English schoolchildren to direct their eyes towards and identify a non-face target in the presence of central, parafoveal and peripheral face distractors of different emotions. Self-reports of anxiety, neuroticism, attentional control and friendship quality were also obtained. All participants showed a normal remote distractor effect. Additionally, results also showed that neuroticism was related to increased saccade latencies to the target in the presence of angry (but not neutral or happy) face distractors for all eccentricities, indicating a broadening of attention for threat in that group. In contrast, psychoticism was found to be associated with a higher proportion of eye movements directed towards the distractor faces (errors) for all types of face distractors, suggesting automatic capture by all face distractors. Poor self-reported friendship quality was also linked to increased directional errors, but this was restricted towards angry distractors. The eye movement data has shown that neuroticism is linked to impaired inhibition of threat and selective attention to threat is important in understanding peer relationship difficulties.

Poster Presentation

The influence of different types of navigation aid on indoor scene memorability

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Researchers try to better understand why some visual scenes are more memorable than others. During navigation in a new indoor environment, we visually encounter many new scenes. Our memory encodes those scenes so that next time we can efficiently navigate through the same environment. In our study, we investigate how different types of navigation assistance impact participants' memorization of encountered scenes in a novel indoor environment. Twenty participants were asked to remember the path, as they had to backtrack by themselves. Three types of navigation assistance were used by each participant: 2D map (MAP), wearable virtual navigator (WVN), and human guide (HUG). A visual memory retention test was carried out after participants reached the final destination. The mean method-related memorability scores for images of encountered scenes were as follow: MAP = 44.7%; WVN = 50.6%; HUG = 45.5%. We do not found significant effect of navigation assistance on scene memorability. These findings support previous work on scene memorability and provide the new insight that scene memorability is not affected by the type of navigation guidance. This may indicate that spatial reasoning and visual memory are dissociated. However, we suspect that cognitive load—associated with different types of navigation assistance—probably contributed to the absence of an effect of navigation assistance. Moreover, our results show that scenes with navigation information are more memorable than scenes without such information. In general, the participants encoded and memorized task-related (i.e., navigation task) semantic knowledge obtained from information contained within encountered scenes. Finally, the participants remembered scenes which are located at important navigation positions, such as, lift lobbies. This may indicate that the location of a scene is linked to its memorability. However, these results may be caused by a fact that much navigation information was contained in these scenes.

Poster Presentation

Automatic effects of processing fluency in semantic coherence judgments and the role of transient and tonic affective states

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Recent literature reported that the judgments of semantic coherence are influenced by a positive affective response due to increased fluency of processing. The presented paper investigates whether fluency of processing can be modified by affective responses to the coherent stimuli as well as an automaticity of processes involved in semantic coherence judgments. The studies employed the dyads of triads task in which participants are shown two word triads and asked to solve a semantically coherent one or indicate which of the two is semantically coherent. Across two studies in a dual-task paradigm we show that a) attentional resources moderate insight into semantically coherent word triads, whereas b) judgments of semantic coherence judgments are independent of attentional resources. We discuss implications of our findings for how people might form intuitive judgments of semantic coherence.

Poster Presentation   **Session B**

Goal neglect and prospective memory failures: A dissociation between knowing and doing

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Goal neglect (GN) is a term used to describe a type of error in human behaviour. In GN, participants can say exactly what it is they should do, yet show no apparent attempt to do so. An explanation for this cognitive failure is not entirely clear. Previous work by Duncan and colleagues (1996, 2008, 2013) suggests that GN reflects an attentional limit but is not susceptible to the real-time demands of traditional attentional and working memory experiments. They propose that GN is closely related to fluid intelligence, and reflects an impairment in constructing an effective control structure or 'task model', early-on when the task instructions are specified. Evidence comes in the form of GN being immune to actual task complexity but significantly modulated by Instructional Complexity (Duncan et al., 2008, Bhandari & Duncan, 2013). Prospective Memory (PM) is the memory for actions to be performed in the future (Einstein et al, 2005). Some of the experimental paradigms used in PM research are similar to the ones used in GN: the participant switches between a dominant ongoing task to a less frequent critical task, and performance on these critical events is used to gauge GN or PM failures. Do GN and PM failures reflect the same cognitive impairment? In a series of new experiments using tasks that morph GN and PM paradigms, we use diagnostic effects on reaction time and accuracy by exploiting the Instructional Complexity effect and manipulating the transparency of the instructional cue to investigate further these phenomena. We propose that there may be multiple separate underlying cognitive mechanisms whose dominance varies as a function of time and structural features of the task. In addition, these cognitive mechanisms appear to be differentially related to individual differences such as age and fluid intelligence.

Poster Presentation   **Session B**

Cross-domain associations in working memory

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Our daily environment is made up of objects rather than single features. Working memory research has for a long time only focused on the maintenance of these single features. Recently, research has started to turn more and more to the maintenance of objects or associations between features. At this moment, studies on the maintenance of feature associations often present inconsistent results concerning (1) the capacity limits, (2) the resources involved and (3) the underlying representations. These points were addressed in three experiments focusing on cross-domain associations in working memory using Brown-Peterson and complex span task paradigms. We observed lower span scores for cross-domain associations than single features, an involvement of domain-general but not domain-specific resources, and an integrated representation of these associations even when attentional resources were particularly low. These results are discussed in light of contradictory results from earlier studies. A critical look on these discrepant results highlights some of the subtleties of working memory functioning. We will then present a model of cross-domain maintenance that incorporates these observed discrepancies and offers a deeper understanding of the maintenance of featureassociations through a focus on intentionality, the availability of attentional resources and the general framework underlying capacity limits.

Poster Presentation

The influence of joint attention on visual working memory: Effects of attention distribution

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Joint attention refers to the mutual focus of two individuals on an object, and is shown to speed target detection and discrimination. Extending the traditional gaze cuing literature, we investigated whether joint attention can enhance visual working memory (WM). Using a novel paradigm, we measured WM for four, six and eight coloured squares as a function of non-predictive gaze cues conveyed by a neutral central face. Squares at encoding were looked at (Congruent), looked away from (Incongruent), or in the presence of direct gaze. In addition, we manipulated whether to-be-remembered items appeared on one side of the cue face only (Unilateral: Experiment 1) or on both sides (Bilateral: Experiment 2), in order to assess the influence of attention distribution on joint attention effects. In Experiment 1, WM was significantly enhanced for looked at information compared to incongruent and direct conditions, irrespective of load. In Bilateral Experiment 2, squares appeared on both sides of the face simultaneously and participants were instructed to remember all squares. Here, gaze had much less impact than in Experiment 1: only at load 8 did looked at squares enjoy a significant advantage in WM. There was no influence of social anxiety. These findings show that joint attention enhances WM for simple items when relevant information occupies just one location in space. However, when attention is required to be more widely distributed effects of joint attention are weakened and only emerge when resources are heavily taxed (high WM load). [Note, however, that other work in our lab using the Bilateral paradigm shows robust facilitatory effects of joint attention on WM when the cue face displays an emotional expression and participant social anxiety is low (see Jackson & Gregory, ESCOP 2015)]. To account for these findings, we discuss potential mechanisms of resource allocation in attention and WM.

Poster Presentation

Components of the Stroop task and their control

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The purpose of the current study was to disentangle and evaluate the contribution of task conflict, informational conflict and response conflict in the Stroop effect. Task conflict was estimated by the contrast between neutral stimuli and color words. In order to distinguish between informational and response conflicts we contrasted incongruent stimuli that belong or belong to the response set. This was done in one experiment by using manual responses and applying the two-to-one paradigm (mapping two colors to one response key and the remaining two colors the other response key). In the second experiment we used vocal responses and employed only two colors and four color words. In parallel, we manipulated the proportion of neutral stimuli. The implications of the obtained results for the model of control monitoring in the Stroop task are discussed.

Poster Presentation   **Session B**

Electroencephalographic and peripheral temperature dynamics during the Psychomotor Vigilance Task

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This study analyzed both EEG dynamics and body skin temperature data recorded while subjects performed a 45 minutes Psychomotor Vigilance Task (PVT). The use of a long PVT allowed us to assess the attentional fluctuations in non-sleep deprived subjects during a vigilance task. Independent Component Analysis (ICA) and time-frequency analysis were used to evaluate the EEG data. Empirical results showed a correlation between temperature and reaction time (RT), as well as an increment in EEG power in alpha-, theta- and betaband frequencies in parieto-occipital, central-medial and frontal components, which were associated with poor performance in the task. This generalized power increment could be the consequence of an increased activity in default mode network, associated with attention lapses. Also, results showed a potential use of the PVT as a tool to obtain individual physiological indices of vigilance that can be generalized to other vigilance tasks.

Poster Presentation

Enhanced temporal prediction in musicians: evidence from behavior and model-based fMRI

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In a multifaceted environment, the ability to identify temporally predictable patterns and detect deviations from these patterns, can be a life-saving skill. When presented with a stream of stimuli, human sensory and cognitive systems encode this temporal structure, implementing temporal prediction. A context where this skill is heavily called upon is music. Musical training combines extensive exposure to auditory sequences with sequential visuo-motor processing. Hence, expert musicians are the ideal sample to test the hypothesis that temporal prediction can improve through training. Previous research on the impact of musical training on cognitive functions yielded controversial results. Whether musicians show enhanced temporal prediction is an intriguing open question. We investigated this hypothesis in two studies, using behavioral and model-based fMRI approaches. In the behavioral study, we tested whether musical training improves temporal prediction, and if this benefit generalizes to non auditory contexts. We implemented a cross-modal attentional cueing task, involving auditory and visual stimuli, manipulating the proportion of compatible trials. The results showed better temporal prediction in musicians (operationalized as sensitivity to proportion of compatible trials). In the fMRI experiment, we investigated the neural underpinning of musicians' advantage. First, we tested the hypothesis that musicians would show increased activity in dorsolateral prefrontal cortex (dlPFC), as a marker of temporal prediction. Second, we tested two predictions of the Hierarchical Error Representation Model (HER, derived from Alexander & Brown 2011): 1) that within medial prefrontal cortex (mPFC), distinct regions show effects of unexpected events and event prediction; 2) that a functional segregation can be traced within PFC, between regions signaling deviations and regions representing temporally structured patterns. The results confirmed all predictions. Taken together, these findings show a cross-modal advantage in temporal prediction in musicians. The related neural mechanisms rely on dlPFC and mPFC, providing evidence for the HER model.

Poster Presentation

Eye guidance competition between emotional faces during encoding in working memory

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Previous research has shown that emotional faces may be prioritised for selection with respect to neutral faces. However, less is know about how different emotional expressions compete for attention and representation in working memory (WM). In this study, four faces with different expressions (happy, sad, angry and fearful) in each trial were presented for encoding into WM for 4s. After a 1s maintenance interval participants were shown a single neutral face and decided whether it matched the identity of a face in the encoding display. The aim was to determine how competing emotional expressions influenced eye movements during encoding, and how WM performance was affected. In early viewing, as reflected mainly by first fixation duration, less attention was allocated to angry faces with respect to other facial expressions. Nevertheless, across the overall encoding period, a greater number of fixations and re-inspections was found for angry faces than for other co-occurring emotional faces. These findings may suggest an initial avoidance of socially threatening stimuli that is subsequently compensated by a more detailed inspection of this type of face. This differential oculomotor pattern, however, did not result in enhanced retrieval of angry faces and there were no differences in response times. Highest accuracy was found for sad faces, but there was no evidence to link this to particular eye movement patterns. These findings do not indicate an obvious link between emotion-specific eye guidance at encoding and subsequent WM retrieval. We propose that the differences in ocular inspection of angry faces may be an implicit "signature" of their behavioural relevance.

Poster Presentation   **Session B**

Simon-like Effect driven by salient visual asymmetries in object stimuli

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Responses to pictures of tools are faster and more accurate when the responding hand is aligned with their left-rightward oriented handles, compared to when it is not - handle-to-hand correspondence effect. According to the affordance activation account, this effect depends on the activation of a proper grasp-to-use gesture towards the designated graspable tip (i.e., functional affordance effect). However, according to the location coding account, the effect is due to a spatial correspondence effect between the location of the response (unrelated to grasping) and the location of the object tip which provides a spatially salient asymmetry in the stimulus (i.e., Simon-like effect). The present study follows-up the investigation on the origin of the handle-to-hand correspondence effect of Pellicano et al. (2010). In three experiments participants were presented with pictures of horizontally displaced electric torches depicted as switched-on (active-state) and switched-off (passive-state) and were required to respond to their length (Experiment 1 and 2) or size (Experiment 3) by pressing a left or a right key, while ignoring their horizontal orientation and functional state. Stronger activation of grasping affordances was expected in the active-state than in the passive-state condition (affordance activation account). However, since in the active-state left-rightward asymmetry was provided by the graspable tip (Experiment 1) or the opposite goal-directed tip (Experiments 2-3), a Simon-like effect was expected as a function of them (location coding account). Results showed no handle-to-hand correspondence effect modulated by the functional state, but performance was affected by the correspondence between the response and the orientation of the salient portion of the stimulus, irrespective of its identity (i.e., the handle in Experiment 1 and the goal-directed tip in Experiments 2-3). These results are hardly explainable in terms of the affordance activation account, but seem to favor a location coding account of the handle-to-hand correspondence effect.

Poster Presentation

Modulations of microsaccade rate and pupil dilation by music reception

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Eye movements can be differentiated into saccades and fixations. However, during fixations the eyes are not still, but constantly moving. These miniature movements are composed of three specific types of movements: microsaccades, drift and an overlapping tremor. There is growing evidence that microsaccades as well as pupil dilation are related to attentional processing, cognitive load and emotional arousal. From these findings the question arises, whether these variables index musical processing as well. In an exploratory study we presented musical excerpts to listeners with the instruction to fixate a visual fixation point during intense music listening. As control, periods of silence were included. Eye movements and pupil dilation were recorded. Music was selected from a broad range of styles, e.g. Electronic Music, Pop, Soul, Rock, Jazz, Classical Music etc. Each excerpt was rated for felt absorption, arousal, valence, preference and familiarity. These ratings were related to microsaccade rate and pupil dilation. In addition, the acoustic features of the music (e.g., puls clarity, roughness, novelty) were continuously depicted by the MIR toolbox as an additional moderator of eye behavior. Results show a complex pattern of effects indicating that listening experience affects the oculomotor system and physiological responses of the pupil differently.

Poster Presentation

Is a picture worth a thousand words? Eye movements during reading of graphic literature

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Whereas processes of reading and scene perception have both been researched extensively in cognitive psychology, little is known about their integration, as required by media with hybrid content such as graphic novels, comic strips, or illustrations in textbooks, manuals, or assembly instructions. How do text and image interact? What is the relative amount of time spent on decoding text vs. image? How effectively can overt attention select relevant parts of the current and upcoming scene? Can cognitive effort be related to different forms of panel transitions (McCloud, 1993)? Here we present first results from an ongoing investigation of eye movements during the reading of graphic novels and other forms of sequential art, eventually leading to the Potsdam Comics Corpus (PoCoCo) of eye movements on graphic novels. Data from the eye movement corpus will be enriched by experimental data. Results suggest that text in speech bubbles and captions is selected first, before aspects of the image are fixated. Much more time is spent on decoding the text than decoding the image. Within the image, characters are fixated more often than inanimate structures and there seems to be a clear guidance towards plot-relevant parts of the scene. Lower-level salience also exerts an influence, but of a relatively minor role. Panel transitions can clearly be related to cognitive effort, suggesting that pre-processing of the upcoming panel is effectively performed by peripheral vision. Taken together, results suggest that text processing plays a relatively important role in graphic literature. Aspects of the visual scene are processed much faster, and parafoveal preview is effectively used to guide the gaze.

Poster Presentation   **Session B**

Effects of irrelevant perceptual grouping on attentional selection in partial report

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Perceptual grouping is the involuntary and effortless grouping of elements with similar features. It is known to modulate performance in attention tasks such as visual search and change detection. In the present study, we investigated whether grouping of targets by a task irrelevant feature influences performance in the partial report paradigm. In our main experiment, subjects were instructed to report as many as possible of a set of briefly presented letter targets positioned on an imaginary circle around a fixation cross. On some trials digit distractors accompanied the letters, and the crucial manipulation concerned the color of elements in these trials. Sometimes, the color of the display elements were arranged according to alphanumerical class (organized condition), and sometimes color was assigned randomly independent of class (scrambled condition). We calculated the cost associated to processing of distractor elements by subtracting performance in trials with added distractors (partial report) from performance in trials with no distractors (whole report), and results showed a small but significant reduction in distractor costs for scrambled trials compared to organized trials. The data thusly suggests that grouping of irrelevant features may interfere with visual selection in partial report.

Poster Presentation

Object labeling modulates feature saliency for real object recognition: an eye-tracking study

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Research has revealed that object recognition is an amazingly quick and automatic process. The identification and categorization of objects occur simultaneously, parallel to a process of spreading activation, which associates the object representation to features and objects of similar colors, shapes, conceptual properties etc. The body of object feature research, as well and many computational models of object recognition, argue for differences in the informational contribution of features such as texture, color and shape in object processing. Also, certain neurophysiological and behavioral findings suggest differences in the processing, as well as selective deficits in the recognition, of objects belonging to different categories. The research we conducted examines the associated relationship of object features and categories, which are defined by how humans interact with them, i.e. through the hypothesized channels of relevant information transfer. The chosen categories included artifacts, food and animals. The conducted behavioral and eye-tracking experiments used simultaneous feature presentation following object representation activation. The results indicate a prevalent relevance of shape throughout the categories, significantly lower only for the category of food, for which the color feature was significantly more pertinent than for the other two categories. The most interesting finding of both behavioural and eye-tracking experiments is that the introduction of the label, in comparison to examination of the features in salience, made shape to be significantly more prominent feature for all three categories. Also, labelling made the colour more prominent feature for object recognition for the category of food.

Poster Presentation

Negative attentional bias in depression

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The main goal of the study was to show that people suffering from depression focus attention on relatively more negative stimuli, while never depressed controls focus attention on stimuli relatively more positive. An additional objective was to examine whether increase in self-acceptance changes the attentional bias of the former. The study involved 40 people with diagnosed depression and 40 never depressed controls. The level of depression was additionally assessed in each participant with a Polish version of Beck's scale. In order to test the attentional bias a method called Deployment of Attention Task, inspired by the procedure presented by Wang, Brennen and Holt (2006), was used. Self-acceptance was manipulated by self-affirmations. According to the hypothesis the results showed that people suffering from depression exhibited a choice preference for the relatively more negative words and differed significantly from never depressed controls, who exhibited a choice preference for the relatively more positive words. Moreover, increase in self-acceptance abolished the attentional bias in depressive patients, but for a short time. The obtained result may suggest that people suffering from depression focus their resources on the affectively negative elements of their cognitive environment, as if to confirm their view of the world (which can act like a self-fulfilling prophecy). The effect of self-acceptance raising, shown in these people, may be useful in the therapy of this ailment.

Poster Presentation

Does training lead to a general enhancement in working memory function?

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Multiple studies and meta-analyses have demonstrated that intensive practice on memory-taxing activities improves performance on untrained working memory tasks. It is not yet known whether these effects reflect fundamental changes in the efficiency of the working memory system related to changes in neural activity, or the development of compensatory task-specific strategies. To assess whether training leads to a general enhancement in working memory we compared the effects of two training regimes. Participants trained on one of two working memory paradigms, N-back or complex span. There were verbal and visuo-spatial variants of each regime and both the stimuli and training intensities were matched across paradigms. Transfer tests of verbal and visuo-spatial N-back and complex span were completed by all participants before and after training. These contained different stimuli to the training activities, and in the case of the complex span tasks the processing activity also differed. This design enabled us to test within paradigm transfer to tasks with the same structure but different materials (e.g. gains in N-back after N-back training) and, most importantly, to assess cross paradigm transfer (i.e. does training on N-back tasks improve performance on complex span tasks and vice versa). To control for practice effects on the transfer tasks, a third group of participants were recruited to form a test re-test group. Our preliminary results demonstrate that the effects of complex span training do not generalise to other complex span tasks with distinctive stimuli and different processing demands. Trainingrelated gains in N-back transfer to other N-back tasks with different materials that have the same recognition and updating processing demands, but not to complex span tasks. This data supports the argument that multiple processes contribute to each working memory paradigm and that the overlap in task processes between the training and outcome measures constrains training-related transfer effects.

Poster Presentation

The reference-back task: Separating the contribution of WM updating, automatic updating, matching and gating to n-back performance

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Working memory (WM) has two major functions: Maintenance, which is the ability to shield information from being overwritten by irrelevant information, and updating, which is the ability to modify the maintained information when needed. These two conflicting demands are controlled by a gating mechanism which enables selective control over updating. When the gate is closed, information is robustly maintained while opening the gate, enables updating of WM. The goal of this study was to separate the contribution of controlled, gatedependent updating to performance in the n-back task. To do so, we used a newly-designed reference-back task. This variant of the n-back task is composed of two types of trials: reference trials which require both matching (i.e., a same/different judgement) and WM updating, and comparison trials which require only matching. This task enables separating the contribution of the matching decision, of automatic updating, gateswitching and WM updating to task performance. Sixty participants performed the following tasks: 2-choice RT, 1-back, 2-back and the reference-back task. A multiple regression approach was taken in order to explain individual differences in 1-back and 2-back by individual differences in the mentioned sub-processes, which were extracted from performance in the reference back task. The results indicate that RT in both 1-back and 2-back is mainly predicted by gate opening (namely, the cost of switching from comparison to reference trials) and by WM updating. Furthermore, results of the reference-back provide new behavior support for the gating mechanism as seen by the significant switching cost between the two states of the gate as implemented by switching between the two trial-types of the task. The implications of the results on the use of the n-back task are discussed.

Poster Presentation

Capacity and precision of visual working memory for complex objects

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Working Memory (WM) is an essential but limited resource; therefore it is at the heart of much research. Recent studies applied delayed estimation tasks, which enable an assessment of memory capacity (how many items), and its resolution (how precisely items were recalled) separately. Most of these studies used basic visual features such as color and orientation, so it is still unclear how complex stimuli are represented in working memory. The only study that used delayed estimation task with complex stimuli – faces, suggested that complex objects are represented with variable precision and not in an all or none manner. However, this study used a single database of artificial faces that were repeated in all trials. Under such conditions stimuli become familiar thus enabling participants to use long term memory strategies, rather than working memory when performing the task. To directly study WM processes while avoiding the reliance on long term representations, here, we used a delayed estimation task using image of natural, color faces, all with comparable age and from the same gender, and importantly, in each trial we presented a new face. In two experiments, participants were presented with a display array of one or three faces. Following one or six seconds of a blank retention-interval, participants had to determine the identity of one previously presented face by selecting it from a continuous scale of morphed faces. We found decreased performance with a higher memory load (three vs one face) and following longer delays (forgetting). Interestingly, this difference was only evident in the guessing probability but not in the precision of recall. We conclude that faces are represented with a fixed precision in WM. Consequently, when one tries to remember too many faces, or maintain them in memory for longer delays, some representations simply disappear rather than becoming degraded.

Poster Presentation

Working memory consolidation

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Information dissipates rapidly in working memory. However two main types of mechanisms have been described that are thought to counteract this rapid loss. One type is seen as maintenance mechanisms (refreshing or rehearsal, Camos, Lagner, & Barrouillet, 2009; Cowan, 1995) the other type is called consolidation (Jolicoeur & Dellacqua, 1998). Consolidation is conceptualised as the encoding of sensory traces into more stable short term memory traces that can survive several seconds. Due to its nature, this process is thought to play a crucial role in working memory performance (Ricker & Cowan, 2014). A recent study by Bayliss, Bogdanovs and Jarrold (2014) suggests that the processes of consolidation and attentional refreshing are to some extent different. In two experiments, we provided extra consolidation time in a complex span task procedure by varying the time between the presentation of the memory item and the onset of the intervening task (from 0 to 5 seconds). The cognitive load of this concurrent task was also manipulated. Results revealed a strong effect of the time available for consolidation when concurrent activities impose a high cognitive load preventing maintenance mechanisms to operate. In the second experiment however, we observed that even with a low cognitive load there was still an effect of the consolidation time. Additional analyses demonstrate that the time available before the onset of the concurrent task (i.e., the opportunity of consolidation) has roughly the same effect as the time available for refreshing during this concurrent task, suggesting that consolidation and refreshing are not that different.

Poster Presentation

Electrophysiological correlates of the coactivation and selection of simple arithmetic facts

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The purpose of the current study was to determine the electrophysiological correlates associated to the coactivation of arithmetic facts and the possible inhibitory mechanism responsible to select the correct one. To this end, we used an adapted version of the negative priming paradigm, in which simple additions were presented and participants had to decide whether they were correct or not. We evaluated the N400 component as an index of the spreading activation during the retrieval of arithmetic facts; the FN component, associated to inhibitory processes; and the P200 component, which reflects the difficulty in the retrieval of arithmetic facts. When an addition was incorrect but the result was that of multiplying the operands (e.g., 2 + 4 = 8), the N400 amplitude was more negative compared to an unrelated condition (e.g., 2 + 4 = 10). This finding supported the coactivation of irrelevant multiplication facts when participants resolved addition problems. Furthermore, the FN amplitude was higher when an addition whose result was that of multiplying the operands of the previous trial was presented (e.g., 2 + 6 = 8), supporting the role of inhibition during the selection of arithmetic facts. In the same direction, the P200 amplitude was higher in these additions whose result was that of multiplying the operands of the previous trial (e.g., 2 + 6 = 8), suggesting that the inhibited result in the previous trial was more difficult to retrieve when it was needed to perform the task afterwards.

Poster Presentation

Number-space and pitch-space interactions in the numerically impaired brain

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Number is not encoded by a dedicated brain module; instead, there is evidence that the parietal lobes hold a common metric underlying the processing of number and other dimensions pertaining to cognition, perception and motor control. One of these dimensions is musical pitch, which shares not only neural resources with number but also the ability to interact with space when a left/right response is required in response to stimuli requesting its implicit or explicit processing. Such phenomena are known as stimulus-response compatibility (SRC) effects. For number, a well-described SRC effect is the SNARC (spatial-numerical association of response codes), whereby responses to small numbers are faster and more accurate with the left hand, and to large numbers with the right hand. More recently, an equivalent effect in the pitch domain, the SPARC, has been demonstrated. Given these overlaps between the number and pitch domains, one relevant question is to what degree impairment in one domain affects the SRC effect in the other. Here we aimed to answer this by investigating the two effects in lesion patients with numerical impairments, as compared to healthy controls. The results suggested a double dissociation, with SNARC but not SPARC present in controls, and SPARC but not SNARC present in patients. Individual patients treated as single cases confirmed this pattern and also suggested that, within the number domain, not only SNARC but also their performance on the number line task is outside of the normative limits – reminiscent of the controversy concerning the necessity of the number-tospace mapping ability in the existence of SNARC. These results suggest that SRC effects involving spatial responses to number and pitch respectively can dissociate in the numerically-impaired brain, which might suggest a deeper-level dissociation between the two domains also in the non-impaired brain, despite their irrefutable neural and behavioural overlaps.

Poster Presentation

When zero counts: Number transcoding in right-hemisphere damaged patients

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While there is extensive evidence for the crucial role of the left hemisphere in number transcoding (e.g. Deloche & Seron, 1983; Delazer et al., 1999; Cipolotti et al., 1994), the contribution of the right hemisphere (RH) is considerably less understood. Pioneer neuropsychological studies hypothesized that errors in right hemisphere damage (RHD) patients derive from a processing failure of the left hemi-space (Dahmen et al., 1982; Rosselli & Ardila, 1999) or to the spatial abilities involved in constructional praxis (Basso et al., 2000). Recent work, however, evidenced numerical errors in RHD patients, which were hardly explained by such proposals (Grana et al., 2006; Furumoto, 2006; Benavides-Varela et al., 2014). The current research offers data that contribute to clarifying these theoretical inconsistencies. The investigation included 22 RHD patients and 22 healthy controls who completed a numerical transcoding battery along with a neuropsychological assessment. A detailed qualitative analysis of errors evidenced that the RH is crucial for transcoding complex digits containing zeros. Moreover, a lesion-symptom mapping analysis (Rorden et al. 2007) points to the rightinsula, and portions of the right temporo-parietal junction as possible areas implicated in the representation of zeros. Notably, error categories corresponding to the so-called Neglect errors (reported as "spatial errors" in pioneer studies) constituted only about 10% of the total reading and 2.72% of the writing mistakes made by the patients; these errors, however, were not significantly associated with specific areas in the RH. These novel findings highlight the contribution of the RH to the internal representation(s) of zeros and the spatial organization of numbers, albeit to a lesser extent. The extent to which dealing with zeros requires brain areas different from those traditionally associated with processing of other digits will be discussed in light of the current models of number representation and number transcoding.

Poster Presentation

Sequential effects in mental arithmetic

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A large number of studies have investigated how people dynamically adapt their behaviour to keep performance in accordance with internal and external goals. One central hypothesis in the literature proposes that experiencing processing difficulties, conflict or errors all serve as triggers for such behavioural adaptation. Tasks such as the Stroop task produce a marked congruency effect: responses to incongruent trials are slower and more error-prone than responses to incongruent trials. The size of the congruency effect has been shown to depend on the congruency of the previous trial: following incongruent trials, the congruency effect is smaller compared to following congruent trials. This congruency sequence effect, often referred to as conflict adaptation, has spawned an interesting series of studies, confirming its position as a key marker for cognitive control. However, these studies typically employ simplified, strictly controlled tasks that do not do justice to more complex everyday situations and decisions, which usually require more than applying a limited set of stimulus-response rules. One more complex, yet daily-used task that allows testing in a laboratory setting is mental arithmetic. Mental arithmetic may (partly) depend on similar cognitive control processes that are involved in more simple experimental tasks. In the present study, we aim to investigate to what extent participants will adapt their behaviour in response to recent processing difficulty (i.e., show conflict adaptation) in several arithmetic operations, namely multiplication, addition and subtraction. The present study focuses on if and how participants adapt to different levels of difficulty in arithmetic verification tasks. Results are discussed and theoretical implications will be highlighted.

Poster Presentation

Cognitive relations between non-symbolic and symbolic approximate operations, and mathematical proficiency

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Numerical representations are thought to rely on two representation systems: symbolic (e.g., Arabic numerals such as "6" or number words such as "SIX") and approximate non-symbolic (ANS) representation (e.g., a group of dots). The fact that these representations are related is well documented. However, the current literature is inconclusive regarding their relationship with mathematical proficiency. ANS is commonly examined by comparison tasks. Recently some studies have focused on the performance of math operations (i.e., addition, subtraction and multiplication) using non-symbolic and symbolic representations. The current study focus on three types of mathematical operations: (1) approximate non-symbolic mathematical operations (e.g., adding groups of dots and estimating their sum), (2) approximate symbolic mathematical operations (e.g., estimating the sum of 37+41), and (3) exact symbolic mathematical operations (e.g., 7+8=15, 64+23=87). The objective was to examine the relationships among themselves and between them and mathematical proficiency. Participants were presented with inverse (X+Y-Y) and non-inverse (X+Y-Z) computer animations of mathematical operations. All of the tasks were presented in three formats: (1) ANS operations, (2) approximate symbolic operation and (3) exact symbolic operations. The ratios between the operation outcome and the compared quantity were manipulated in both of the approximate tasks, and included three different ratios (0.3, 0.5, 0.7). In addition, participants went through working memory tests (number and letters and digit spam) and a standardized test of mathematical proficiency (Woodcock-Johnson). Linear and logarithmic slopes for the three different ratios, were extracted individually for each participant. Relationships were found among the types of operations and between them and mathematical proficiency. This was found when controlling working memory ability.

Poster Presentation   **Session B**

Conceptual size norms: Size estimation by line placement

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Conceptual size is the subjective mental representation of the real-world size of objects. Conceptual size can be derived from objects representations such as drawings of objects. As a subjective magnitude dimension, which relies on object recognition and familiarity, conceptual size requires reliable norms. Up until now, several studies have tried to create a legitimate assessment design that can give reliable conceptual size norms. However, in those studies there were significant shortcoming that limited the use of these conceptual size norms. In our study, we addressed these shortcomings and created a novel assessment design for conceptual size. First, subjects were asked to name the color drawing of different objects that were presented in different physical sizes. Accuracy and reaction time (RT) were recorded, allowing us to verify that all objects were familiar and recognizable regardless of the presented visual size. Furthermore, we excluded objects whose recognition speed was deviant. Next, subjects were given a horizontal line with a conceptually large object at one side and a conceptually small object at the other side. Subjects were asked to place different objects along the line, according to their conceptual size while using the ends as references. We excluded objects whose size ratings were not stable (as reflected by cumulative variance). Thus, we created a reliable conceptual size norms based on the remaining objects' size ratings. These norms will allow researchers to use conceptual size as an experimental variable for a better understanding of its automatic processing and internal representation.

Poster Presentation

Predicting arithmetical performance from children with different profiles: A longitudinal study

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Numerous studies lead to the assumption that the mathematical understanding of children from low-income background or presenting multiple developmental disorders is poorer than that of their peers (e.g., Geary, 1994, Landerl et al., 2013). This discrepancy seems to begin before children enter formal schooling (e.g., Mejias and Schiltz, 2013). Nevertheless, the study of this relationship is full of complexities because neither early nor later number competences, nor socio-economic status (SEI), nor the other related cognitive processes (such as language skills or attention) are unitary phenomena. The aim of this study was to further investigate the development of early formal arithmetical knowledge and clarify its link with other related cognitive factors or skills, as well as children's socio-economic background. To this aim 80 children of the 1st and 2nd grades of primary school were assessed with different neuropsychological (i.e. finger gnosis, reading, attention, memory, etc) and scholastic tests at two different times of children's development. All children were evaluated a first time at the beginning of first grade with a new mathematical prerequisites test and a second time during second grade with a classical mathematical test. The relationship between the variables measured in these tests, the schools' SEI and the performance in other cognitive domain were analyzed. Results indicate that children with a bad/good mathematical competency at the entrance of primary school were inclined to preserve their bad/good achievement levels a year later. Moreover, children's numerical performance was impacted by their schools' SEI and their other cognitive abilities (as reading, attention, memory, etc). These findings suggest that our novel mathematical prerequisites test is an efficient predictor of children's mathematical proficiency one year later for all SEI levels and that it can reliably be used to predict future mathematical competency at the beginning of primary school.

Poster Presentation   **Session B**

The implication of using implicit cognitive test to study math anxiety

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A vast body of research indicates that mathematic anxiety (MA) emerges at elementary school, persists over the years, and affects academic and daily performance. Traditionally, MA measurement relies on introspective questionnaires, providing inconsistent and often unreliable data. Therefore, there is a need to develop valid and reliable research tools in order to enable comparative and developmental research. For this purpose, we developed a novel cognitive task, the Numeric Dot Probe, based on the well-established dot probe task. The task assesses attention allocation by brief presentation of stressful (e.g. equation or math related word) or neutral (e.g. neutral word) stimuli. Afterwards, a small probe replaces the stimulus or appears at the opposite side of the screen and participants are asked to define it. The main hypothesis was that high MA participants will automatically allocate attention to the stressful stimuli and later will struggle to re-orient attention to different stimulus, a pattern that will affect their reaction times (RTs). Our goal was to capture the exact threshold when a numeric stimulus becomes stressful. We did so by manipulating the stimuli complexity, including single, double and triple digits, as well as powers simple equations. Participants were asked to solve the equations by determining whether a number/word presented after the probe was the correct answer to the former equation/rhyming with the former word. Early findings from the experiment, including high and low MA college students, yield promising data, suggesting that the Numerical Dot Probe is a suitable cognitive tool for MA measurement.

Poster Presentation

Developmental features of the embodied self representation in spatial perspective taking

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Spatial perspective taking consists of mental self-rotation and other cognitive information processing. Mental self-rotation is a process of rotating an embodied representational self through mental simulation of the sensorimotor mechanisms underlying actual self-movement. It was predicted that physical development would affect the operation of the representational self. To verify this hypothesis, one hundred and nineteen individuals aged 5–80 years (in the three age groups of children, students, and elderly people) executed a video game task of spatial perspective taking in three conditions of sensorimotor activation: a restrained, stable, and unstable condition. Some data were excluded from the main analysis as outliers and the final sample comprised 30 participants in each age group. In the linear function formulas considering the degree of rotation and response times, the gradient represented the theoretical speed of mental self-rotation and the intercept represented other cognitive processing. A two-way repeated measures ANOVA was conducted on the gradients and the intercepts with age group as an independent variable and condition as the repeated measure. Significant main effects of age group and condition on the gradients and a significant main effect of age group on the intercept were found, suggesting that the sensorimotor activation lead to the acceleration of mental self-rotation. A significant interaction was found between age group and condition on the gradients, indicating that the response times in the unstable condition were faster than the other conditions for the children, the restrained condition was slower than the other conditions for the students, while no difference was found for the elderly adults. The results suggest that the influence of sensorimotor activation on the embodied representational self depends on developmental changes in physical control.

Poster Presentation

We don't always use motor simulation: Posture imitation by motor imagery and posture matching by visual imagery

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The aim of the present study was to understand the underlying cognitive processes of posture imitation and posture matching. The resonance motor imagery-based mechanism hypothesis posits that both posture imitation and matching might be supported by motor imagery. However, another possibility is that posture imitation might rely on motor imagery, whereas posture matching might be based on visual imagery. We set up two experiments to demonstrate that posture imitation might rely on motor imagery but not on visual imagery (Experiment 1; n = 28) and that posture matching might rely on visual imagery but not on motor imagery. In experiment 1, participants have to imitate a given posture whereas in experiment 2, participants have to compare two postures. Moreover, all participants performed a motor imagery task and a visual imagery task. For each participant, reaction times for imitation and matching tasks were recorded and a progression slope was computed for the motor and the visual imagery tasks. Results showed that performances on the imitation task significantly correlated with the progression slopes of motor imagery task but not with the progression slopes of visual imagery task, whereas performances on the matching task significantly correlated with the progression slopes of visual imagery task but not with the progression slopes of motor imagery task. Those results suggest a double dissociation between the cognitive processes underlying posture imitation and posture matching. The way we imitate or we have to compare postures depends on motor imagery or visual imagery, respectively. In broad terms, when our own body is not directly involved in the preparation or the execution of an action, we might not refer to a resonance motor imagery-based mechanism but rather on visuospatial abilities.

Poster Presentation   **Session B**

Updating spatial information from narratives

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In 4 experiments we examined whether reasoning about spatial scenes acquired through narratives, can be influenced by people's physical movement in space during encoding. Participants read a narrative that described the geometry of a store and objects located at canonical and diagonal axes. In Experiment 1, participants encoded locations by walking towards every object described in the narrative and then returned to the center of the room. After an instruction to visualize all objects, they physically rotated 90o to the right of their initial facing orientation and carried out a series of trials that entailed pointing to objects from imagined perspectives. In follow-up experiments we gradually reduced the extent of physical movement during learning. In Experiment 2 participants rotated their body to the direction of the described objects instead of walking to them, while in Experiment 3 they only rotated their heads to these directions. In Experiment 4, we also eliminated the instructions to visualize the objects. Results from the first three experiments revealed a performance benefit for responding from the perspective that participants physically occupied at testing, suggesting that they had updated their representation during the physical rotation to that orientation. However, results from Experiment 4 showed that many participants did not exhibit the benefit for the physical orientation. Interestingly, only participants who claimed that they had linked the described environment with the immediate space of the laboratory exhibited such a benefit. These findings indicate that (1) an influence from one's physical orientation on reasoning about described environments is present if the remote environments are linked with participants' sensorimotor framework that typically maintains immediate spatial information (2) visualization instructions are sufficient to produce such a link.

Poster Presentation

Isolating perceptual from motor processes reveals selective motor inhibition during the prime-target task

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The human cognitive system is capable of resolving conflict between task-relevant and -irrelevant information in a flexible manner depending on task context. The aim of the present study was to investigate how cognitive control is recruited to overcome the interference elicited by a short vs. a long-lasting distracting stimulus, when a fast response is required to a subsequent stimulus. The activation-suppression model would predict that the motor interference automatically elicited by a distracting stimulus would be inhibited in an effective manner only when the stimulus is long-lasting. Indeed, the model specifies that the mechanism of motor inhibition would be effectively implemented only when sufficient time is provided between the distractor stimulus onset and the response to the target stimulus. To test this, either the effect of brief (e.g., 100 ms) or very long (e.g., 1000 ms) distractor stimuli were examined. Moreover, in order to reveal the motor source of the inhibitory processes, we proposed to examine perceptual and motor effect separately. Results showed that perceptual congruency effects remained facilitating (positive, reflecting no effective inhibition) irrespective of prime duration or response time. A different pattern of results was observed for the motor interference effects. Positive motor congruency effects were observed when the prime was brief, reflecting motor activation of primes. However, motor congruency effects turned negative when the prime duration was long, reflecting efficient response inhibition. In addition, the motor congruency effect became increasingly negative as a function of response time, indicating that motor inhibition built up as responses became slower. Thus, perceptual processing of the prime continuously facilitated target responses, while its corresponding motor activation was progressively inhibited in order to optimize task performance. To conclude, isolating the type of processing in the conflict task seems to be crucial to reveal motor inhibition as a strategy to overcome the conflict.

Poster Presentation

The dynamics of instruction-based stimulus-response-outcome learning revealed by event-related potentials

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Humans are the only higher animals that are capable of acquiring novel behavior by instruction, shortcutting time demanding and potentially harmful trial and error learning. This requires transformation of explicit knowledge about which behavior (R) yields the desired outcome (O) regarding a certain stimulus condition (S) into fluent action. Following-up on earlier fMRI studies (Ruge & Wolfensteller, 2010, 2013, 2014) the goal of the present EEG study was to characterize the neural correlates of instruction-based learning of novel S-R-O associations on a much finer time scale. We first analysed learning-related amplitude changes of event-related potential (ERP) across the repeated instruction and implementation of unique S-R associations. An analysis of the corresponding stimulus-locked ERPs revealed that instructed S-R learning is mirrored by a gradually increasing positivitiy at central electrodes in a 450 – 500 ms time range followed by a sharply decreasing positivity at parietal electrodes at 600 – 650 ms. Importantly, a stronger increase in the earlier positivity correlated with a larger learning-related speed-up of response times. We also analysed learning-related ERP changes upon outcome presentation following correct manual responses to identify the correlates of R-O integration. We found a learning-related ERP modulation at frontal electrodes which correlated with a behavioral marker of R-O associational strength. We suggest that these three learning-related ERP modulations might reflect, respectively, (i) increased fluency in action selection based on increasingly well encoded pragmatic rule representations, (ii) decreasing need for working memory updating of the instructed, symbolically represented rules, and (iii) increasing R-O integration as opposed to mere perceptual outcome habituation. Ruge, H., & Wolfensteller, U. (2010). Cereb Cortex, 20(7), 1656-1667. Ruge, H., & Wolfensteller, U. (2013). Neuroimage. 68, 162-172. Ruge, H., Wolfensteller, U. (2014). Cogn Affect Behav Neurosci; DOI 10.3758/s13415-014-0325-4

Poster Presentation

Spatial and motion stimulus-response correspondence effects under cognitive load

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Previous studies show that spatial stimulus-response correspondence (spatial SRC) and motion stimulusresponse correpondence (motion SRC) are separate phenomena with regard to the interaction between perception and motor actions. In the first experiment, we tested this hypothesis by designing a visuo-motor task in which we pitted both SRC effects against each other. Participants moved leftward or rightward with two joysticks held in left or right hand in response to a stimulus with leftward or rightward motion that could be located on the left or right side. The results showed that spatial and motion SRCs are independent. Since it has been claimed that SRC effects are based on automatic processes we expected that both SRCs should not be affected by cognitive load. We verified this hypothesis in the second experiment by testing both SRC effects in a single task under working memory load. Participants had to maintain in working memory either additional spatial or alphabetic information while performing the task with the joysticks. Results showed that working memory load led to interaction between spatial and motion SRC effects. Our findings demonstrate the role of cognitive load in SRC phenomena as well as constraints to the idea of automaticity underlying SRCs.

Poster Presentation

Exploring modality-specificity of response-effect compatibility

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Greenwald (1972) proposed the concept of ideomotor compatibility, according to which certain response-effect (R-E) mappings are stronger than others because the stimulus resembles the anticipated sensory response effects (e.g., auditory stimuli should fit well with vocal responses because the latter usually produce auditory effects). In the present research, we aim to investigate various different modality mappings in a R-E compatibility (REC) paradigm. In Experiment 1, we replicated an experiment of Badets, Koch & Toussaint (2013), where vocal number word responses produced visual digit effects on the screen. The effect stimulus was either compatible or incompatible with the preceding response (i.e., TWO followed by 2 vs. 8; blocked manipulation). While the original experiment used only Arabic digits as effects, we added a number word effect condition. We found a larger REC effect using number words than digits as effects. In Experiment 2, we use vocal number word responses and auditory number word effects in order to examine whether REC effects are stronger with modality mappings that are more ideomotor compatible. In the context of further experiments using manual/vocal responses and visual/auditory effects, this research will allow us to assess the influence of modality mappings on REC effects and thus contribute to further development of ideomotor approaches in action control, numerical cognition, and language processing.

Poster Presentation

Session B

Lexical retuning in native and non-native listeners under optimal and adverse listening conditions

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The perceptual system in native and non-native listening is remarkably flexible (Cutler, 2012). Listeners have been shown to quickly recalibrate both native and non-native phonetic category boundaries in the face of ambiguous input (Reinisch et al., 2013; Drozdova et al., 2014). Since lexical information is necessary to induce lexical retuning (Norris et al., 2003), the presence of background noise might impede this process. When stimuli, with the exception of the ambiguous target sounds, were fully masked by noise, indeed, no retuning occurred for native listeners (Zhang & Samuel, 2014). We further explored the bounds to lexical retuning in native and non-native listening. In four experiments, native (English) and non-native (Dutch) listeners were exposed to a word-final sound ambiguous between English /ɹ/ and /l/ in a short story presented either in clean or with intermittent noise (never on the critical word). Subsequently, listeners had to perform a phonetic categorization task. To investigate the effect of linguistic skills, proficiency (LexTale) and phonological sequence learning ability (Llama-D) were measured and added as predictors in the analyses. The responses in the phonetic categorization task were analyzed with mixed-effect models. In clean, both the native and non-native listeners demonstrated lexical retuning. Crucially, in the partially-masked condition, retuning did not emerge for non-native listeners (see also, Drozdova et al., 2015), while native listeners retuned their phonetic categories, suggesting that the uncertainty induced by the noise had less of a debilitating effect on the natives' than the non-natives' perceptual system. Of the linguistic skills, only Llama-D modulated lexical retuning and only in non-native listeners. Arguably, non-native listeners who are better at recognizing patterns in spoken language may be better able at keeping both the lexical representation and the imperfectly matching acoustic form active in memory, thus relying less on lexical knowledge and in turn reducing lexical retuning.

Poster Presentation

Peripheral actions modulate vertical visual asymmetry

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Some aspect of visual perception can be influenced by repeated motor actions in a specific space-location. It is known that pointing to the right or to the left modifies the straight ahead perception. The impact of motor activity on peripheral space perception, in response of peripheral visual stimulation remains unknown. In the present study, we explored if pointing produced in the peripheral visual field influences peripheral visual perception. Participants had to fix a central clue, and to point at a flashed peripheral target without gazing at it for 400 trials. Target appearance was in the same horizontal axis than the central clue for one group and below in the lower peripheral field for a second group. Subsequently they performed a geometric shape discrimination task (i.e., circle or star) in their whole peripheral visual field (i.e. from 15° to 53°). We first observed that, following the pointing task, the RTs for correct responses were faster in the lower visual field than in the upper field, for stimuli from 30° up to 53°of eccentricity, in both groups. This asymmetry was observed only from 45° up to 53° in a control group that did not performed the pointing task. These results suggest that peripheral movements in response of peripheral stimulation modulate peripheral space perception.

Poster Presentation   **Session B**

Source analyses of ERP activity related to combined vergence eye movement preparation

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Vergences are one of the most important cue for depth perception. Recent studies proved that different cortical structures are involved in that kind of eye movements, as compared to pure saccades. However, the specific involvement of these areas is still unexplored. The aim of the present study was to examine the activity of cortical sources associated with the saccade and combined vergence eye movement preparation. Six LEDs were located at eye level on two isovergent circles at two distances: near (20 cm) and far (1 m). The eccentricity of the lateral LEDs was 10o for both distances. The subject was instructed to look at the target LED as quickly and precisely as possible. The EEG was recorded from the scalp (64 active electrodes, Brain Products). Source analyses with BESA indicated that four pairs of regional sources are likely to be associated with preparation of the eye movements (R.V.=1,17%). The sources were located in: (1) the extrastriate cortex (the occipital lobe), (2) the superior temporal gyrus (the temporal lobe), (3) the frontal eye fields (the frontal lobe), and (4) the middle frontal gyrus. In all eye movements activation of occipital extrastriate cortex was observed (peak about -80 ms before saccade onset). Activation of this particular region may reflect the decoding of the direction of the stimulus. Vergences (mainly combined convergences) were additional related to strong activation in temporal (-160 ms and -60 ms before saccade onset) and frontal lobes what may suggest engagement of these areas in depth perception.

Poster Presentation

Lateralization of visual functions

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The two cerebral hemispheres have been shown to be differentially specialized for a number of cognitive and sensory functions, referred to as 'lateralization' of the brain. One domain of functions for which lateralization has been studied is that of visual perception. For a number of visual functions, lateralization was found by some researchers, but could not be replicated by others. Also in our lab, we were able to replicate lateralization of some visual functions (face perception and global/local perception), but did not find convincing results in favor of lateralization of other functions (categorical perception of colors (or 'lateralized Whorf effect'), categorical and coordinate spatial relation processing), or only marginally so (spatial frequency perception). We hypothesize that, while some individuals can be strongly lateralized for a certain visual function, this is not necessarily the case for all people. Because statistics are generally done on group level, the participant group needs to be composed such that enough (strongly) lateralized participants are included, in order to find a significant lateralization effect. Moreover, with our experiments we show that task factors can play a large role in the surfacing of a lateralization effect in behavioral data. We take our results, and the discrepancies found in the literature, to indicate we should be looking at lateralization of function at the level of individual participants. We take our results, and the discrepancies found in the literature, to indicate that in future studies, we need to be looking at lateralization of function at the level of individual participants. We will be able to do so by testing lateralization of a range of different functions within participants. Moreover, this will enable us to examine whether lateralization for one visual function relates to lateralization of another.

Poster Presentation

Influence of visual manipulations in letter processing in poor and good readers

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The main objective was to distinguish between the magnocellular and the parvocellular visual systems, using spatial frequency filtering of stimuli in a letter identity judgement task with two groups of young adults, either poor (PR) or good reader (GR). Stimuli were either presented unfiltered (control condition) or filtered (bandpass filtered, biasing processing toward the parvocellular system; low-pass filtered, toward the magnocellular system; or notch filtered, which combines the band-pass and the low pass filters). Stimuli were two letters presented with the same (e.g. BB or bb) or different typography (e.g. bB). The task was to judge whether the pair was the same repeated consonant or two different consonants, regardless of the typography (e.g. Bb vs. BN). Results in control condition showed that the GR group was more accurate than the PR group, but was longer, especially in the different typography condition, whereas the PR group was not significantly affected by typography. However, for filtered stimuli, the increase in RT due to different relative to same typography was found in both groups, tough higher in the GR group. Moreover, a main effect of filter was found, with lower accuracy and rapidity for the notch filter than for the band-pass filter only. This was found in accuracy specifically for the PR group, and in RT, specifically for the different typography condition. Taken together, results are consistent with the elaboration of an abstract representation of letter in the GR group, who are highly sensitive to typography manipulations but not to visual manipulations, whereas the PR group was affected by visual manipulation only. In this group, isolated parvocellular or magnocellular processes were efficient whereas the loop of magnocellular on parvocellular processes appears to be still developing.

Poster Presentation

Predictable contexts about whether a sensory consequence follows an action influences pre-movement potentials

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The planning and execution of a voluntary action involves making predictions about the consequence of the action. The neural signature of these predictions are thought to arise prior to the execution of an action, yet they remain elusive. While predictions about the frequency or timing of sensory consequences have previously been explored, it is still unclear if the context of "whether" a consequence will follow an action influences the neural signature of action-effect processing. In an EEG experiment we manipulated the expectation that a sensory consequence (a tone) would follow an action or not. In this paradigm, participants were required to make a sequence of voluntary key presses. In the predictable condition a tone would follow a key press 75% of the time, whereas in the non-predictable condition a tone would follow a key press in 50% of trials. No stimulus was presented on the remaining omission trials. Our results demonstrate that action-effect predictability impacts pre-movement potentials. In particular, actions in the non-predictable condition that were preceded by a tone, resulted in greater preparatory activity compared to actions that were preceded by an omission. This pattern was not found in the predictable condition. Our results indicate that during times of uncertainty, the presence of an external consequence updates motor planning areas preparing for the next action. These findings support the idea that motor-related prediction about whether a consequence follows an action, lies on continuum. During predictable contexts there is a reliance on internal predictions, whereas during nonpredictable contexts both internal predictions and external sensory stimuli influence action-effect processing.

Poster Presentation

Can bodily self-perception be modified by auditory signals? Sound-induced proprioceptive drift in the invisible hand illusion

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The rubber hand illusion (RHI), and its new variant, the invisible hand illusion (IHI) is an appropriate experimental model for investigating the multisensory aspects of bodily self-consciousness. Here, we report an unexpected effect of auditory stimulation on the trisensory visuo-tactile-proprioceptive interaction underlying the IHI. The study was originally designed to test whether irrelevant auditory signals can be used as conditioned stimuli to replace the missing visual cues in the IHI. We hypothesized that following a conditioning process in which metronome sound is associated to the experience of the classical RHI, the presentation of metronome beats will enhance the IHI. In our first experiment, involving 26 participants, the IHI was elicited in the presence of metronome beats and in silence (sound versus soundless condition) both before and after the conditioning procedure (pre- versus post-conditioning session). Each participant's hand proprioception and illusory experience were measured in all conditions. A 2 x 2 repeated measures ANOVA revealed a main effect of Sound and Session on proprioception; the perceived hand position drifted towards the body-midline in sound conditions as well as in the post-conditioning session, but surprisingly, there was no interaction between these two effects. In a second experiment with the same setup except using conditioning sound stimuli during the RHI-session, similar results were obtained, showing that the conditioning procedure is not necessary for the sound-induced proprioceptive drift to occur. The combined analysis of the two experiments unambiguously confirmed the presence of sound-induced proprioceptive drift in the IHI. Overall, our hypothesis was not supported, but the results provide relevant contributions to the field. Most importantly, these findings show that the influence of visuo-tactile integration on proprioceptive updating can be modified by irrelevant auditory cues merely through the temporal correspondence between the visuo-tactile and auditory events.

Poster Presentation

Illusory blue from grey medieval mural paintings: priming and learning effects

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Colorimetric analysis of samples from medieval mural paintings showed that while restorers considered them as blue, they had a flat reflectance spectra and central (grey) chromaticity coordinates. Previous results demonstrated that these greys were perceived as blue in the paintings by most of the observers due to both chromatic and semantic contexts. This study aimed at exploring the effect of color learning by varying the order of two color naming tasks. Participants carried out an adapted Stroop task in which the pigments used were samples of the colors from the paintings. The congruent condition was manipulated so that one group had the grey pigment associated with the word GREY, whereas the other had the grey pigment associated with the word BLUE. Participants were then asked to name the color of the critical grey pigments on photos of the medieval paintings. Results showed a congruency effect in the stroop task in both groups. Moreover, the proportion of participants who named the color as "blue" was higher in the BLUE Stroop group than in the GREY Stroop group. These results thus suggest that the false-blue pigment can be induced as grey or as blue by a priming mechanism implemented by a learned association between the critical color (ie. false-blue) and a color name (ie, blue or grey) during the Stroop task. Furthermore, the effect lasts long enough to influence naming several minutes later.

Poster Presentation

Crosstalk between visual and proprioceptive action effects. Is the interaction between perception and action outlasting?

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Using modern tools require to process visual (e.g., a cursor on a display) and proprioceptive (e.g., a computer mouse) action effects. In line with the theory of event coding, studies of visuomotor transformations have demonstrated that visual and proprioceptive information is likely to interact with action execution (=crosstalk). However, previous studies have focused on the crosstalk within a trial as a temporary interaction. The present study investigates whether the crosstalk remains in each trial (within-trial crosstalk) or whether the crosstalk of a previous trial n-1 emerges in a subsequent trial n (between-trial crosstalk). Each trial consisted of two phases: In trial n participants performed a covered horizontal hand movement, and a gain varied the relation between hand and cursor amplitude (phase 1, closed-loop). Then, in phase 2 (open-loop), participants replicated the performed hand amplitude of phase 1 of the previous trial n-1 without any visual feedback. For within-trial crosstalk, we calculated the deviation between the performed hand amplitude (phase 1) and the replicated hand amplitude (phase 2) for each trial. For between-trial crosstalk, we calculated the deviation between the performed hand amplitude (phase 1 in trial n-1) and the replicated hand amplitude (phase 2 in trial n). Concerning within-trial crosstalk, when the hand amplitude varied in trial n aftereffects appeared. Regarding between-trial crosstalk, mean deviations were more pronounced for varying hand than for constant hand amplitudes. But, data suggest that crosstalk within trial n-1 did not emerged per se in trial n. Instead, accuracy of replication depended on the relation of amplitudes between trial n-1 and n. Results will be discussed with respect to recent theories of perception and action, and regression-to-the-mean effects.

Poster Presentation

Consolidation and interference in learning a novel artificial language

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It has been proposed that age effects in second language learning could be due to the fact that adults, as compared to pre-adolescent children, may have increased susceptibility to interference by their native language. We investigated "off-line" gains (i.e., improved performance following the termination of a training experience) and interference effects (i.e., reduction in training-dependent performance gains because of a subsequent experience) in learning a miniature artificial language (14 words) Brocanto3, which was used to describe the moves in a board-game. There were 3 sessions: 1. Explicit instruction of the vocabulary and syntax, followed by 4 rounds of the game (training, playing the game while communicating in Brocanto3) and a test (test1); 2. After a consolidation interval of 24 hours, participants were re-tested for "off-line" gains (test2); 3. A retention test two weeks post-training (test3). Following the initial session, half of the participants played the same board-game using their native language (Hebrew), as a possible interfering experience. Young adults (25 years old) showed significant "offline" overnight improvements in both comprehension (grammaticality judgements) and production (describing game moves) of Brocanto3 phrases. RT in the former and production time in the latter task were reduced by 30% and 20%, respectively. Importantly, speed gains were not at the cost of accuracy. There was also robust retention (test3). The interference group showed significant delayed gains as well, only marginally smaller than those accrued in the no-interference condition. The results show, for the first time, that novel language learning in adults results in significant "offline" gains, with no speed-accuracy trade-off, a hallmark of skill learning. These gains indicate the existence of a consolidation phase in language learning. It is not clear whether memory for Brocanto3 phrases can be interfered by the speakers' native language.

Poster Presentation

Can cathodal transcranial direct current stimulation affect the "two-thirds power law" dynamic illusion?

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Human movements conform to specific kinematic laws of motion. One of such laws is the "two-thirds power law", which describes the systematic covariation between curvature and velocity of body movements. Noticeably, the same law also influences the perception of moving stimuli: the velocity of a dot moving along a curvilinear trajectory is perceived as uniform when the dot kinematics complies with the two-thirds power law. Instead, if the dot moves at constant speed its velocity is perceived as highly non-uniform. This dynamic visual illusion points to a strong coupling between action and perception: however, how this coupling is implemented in the brain remains elusive. In this study we tested whether the premotor cortex plays a direct role in the illusion by modulating its excitability via transcranial direct current stimulation (tDCS). All participants underwent three sessions, at least 48 hours apart, during which they received active cathodal tDCS (1.5 mA) over the left premotor cortex or over the left V1 cortex, or sham tDCS . In every session, during the task participants were required to adjust the velocity of a dot moving along an elliptical trajectory until it looked uniform across the whole trajectory. The data show that the illusion is conspicuous and resistant to tDCS in terms of its magnitude. However, cathodal tDCS increases precision as opposed to sham stimulation, i.e. the perceived illusion is systematically less variable. Furthermore, the number of adjustments needed to provide judgements of uniform velocity increases when stimulating the premotor cortex as opposed to the two other conditions. The results indicate that the dynamic perceptual illusion cannot be disrupted by cathodal tDCS. However, tDCS stabilizes the illusory percept and, when delivered to the premotor cortex, increases task difficulty.

Poster Presentation

The relationship between the use of instructions to manipulate response bias and the confidence-based ROC in eyewitness identification

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In the eyewitness identification literature, much attention has been paid to the instructions (also known as "admonitions") that should be given to an eyewitness prior to the administration of a lineup procedure. In regard to signal-detection theory, the different admonitions induce different levels of response bias (Clark, 2005). If so, then collecting correct and false ID rates across different instructional conditions will trace out the ROC – the same ROC that, theoretically, could also be traced out from a single instruction condition in which each eyewitness decision was accompanied by a confidence rating. Here, we tested whether or not the two approaches do in fact yield the same ROC. A large number of participants (n = 4650) were randomly assigned to either a confidence rating condition or to one of four instructional biasing conditions (very liberal, slightly liberal, neutral, or very conservative). After watching a video of a mock crime and completing a distractor task, participants were presented with instructions followed by a six-person simultaneous photo lineup. The ROCs from both methods (confidence ratings and instructional biasing) were similar. These findings indicate that setting a higher or lower confidence criterion after the fact based on confidence ratings) is conceptually equivalent to using instructions to induce more conservative or more liberal responding before the fact. Both strategies trace out the ROC, and in both cases the diagnosticity ratio increases as responding becomes more conservative, in accordance with predictions made by signal-detection theory (Wixted & Mickes, 2014). Interestingly, the conservative biasing condition (in which participants were instructed not to make an ID unless they were 100% confident) yielded much more liberal responding than responses made with 100% confidence in the confidence rating condition. Generally speaking, confidence ratings allow for a much wider range of biasing options than instructions do.

Poster Presentation

Individual differences in visual perception predict visual long-term memory performance

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Modular accounts of cognition view visual perception and visual memory as independent. Recent representational accounts contrast with this position, and state there is no sharp divide between perception and memory. Rather, visual processing is organised hierarchically in terms of the content of visual representations. This study investigated whether the perception of simple stimuli is related to memory for complex stimuli, which is consistent with representational accounts but not modular accounts. In Experiment 1, participants completed tests of visual perception (colour, contrast, motion perception), visual memory (fractal image recognition, visual associative learning) and non-visual memory (auditory presented verbal associative learning). An exploratory principal components analysis in Experiment 1 revealed three factors related to visual perception, visual memory and non-visual memory. Crucially, visual perceptual sensitivity was correlated with visual memory but not non-verbal memory (whereas visual memory correlated with non-verbal memory), suggesting a two-factor model of visual perception and memory. Experiment 2 replicated the correlation between visual perception and visual memory using a more complex visual associative learning task, conforming the two-factor model. Thus, the ability to make fine-grained visual perceptual distinctions is related to visual memory (Experiments 1 and 2) but not non-visual memory (Experiment 1). That is individual differences in visual perceptual sensitivity predict memory performance for abstract and complex conjunctions of visual stimuli, and vice versa. The results are consistent with representational accounts of perception and memory, but are difficult to reconcile with modular accounts.

Poster Presentation

The origin of semantic context effects in the cyclic naming paradigm: Electrophysiological evidence

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A widely used paradigm to study lexical retrieval during language production is the blocked naming task, in which participants name pictures that are either grouped by superordinate semantic category into related contexts (blocks), or are presented in unrelated contexts (blocks). In the cyclic version of this task, pictures are presented multiple times within a block (each repetition is termed a 'cycle'). For the first presentation of pictures (first cycle), naming latencies are faster in related contexts compared to unrelated contexts. However, from the second cycle onward, the polarity of the effect reverses, with slower naming latencies in unrelated context. An explanation of the this pattern argues that i) the default polarity of semantic contextual effects is facilitation, as observed in the first cycle, and ii) what appears to be 'semantic interference' is in fact differential repetition priming in the unrelated condition compared to the related condition (Navarrete and colleagues, 2014). In the current study, electrophysiological and reaction time measure were co-registered while participants named pictures in the cyclic naming task (blocks were two cycles long). The semantic polarity was replicated, naming latencies in related contexts were faster in the first cycle but slower in the second cycle in comparison to unrelated contexts. This was due to a lack of repetition priming in related contexts (i.e., same latencies in first and second cycles). The EEG data showed a repetition priming. Picture repetition (i.e., second cycle) elicited more positive frontal ERP responses relative to first presentation (i.e., first cycle) starting around 230 ms post-stimulus onset. Critically, the amount of the repetition effect was larger in unrelated contexts, in concordance with the hypothesis that 'semantic interference' in the cyclic task is due to a reduce repetition priming in related contexts. The results are discussed in the context of theories of language production.

Poster Presentation   **Session B**

The influence of planning on the prospective memory performance of young adults

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The present research examined influence of planning strategy on the way prospective memory functions amongst young people. Sixty-one students were given laboratory task in the form of a computer board game (Virtual Week) that was created to imitate many features of daily living. During Virtual Week participants were asked to perform different prospective memory tasks: (1) regular event-based, (2) regular time-based, (3) irregular event-based, (4) irregular time-based. In contrast to the control group, experimental group was using planning strategy. As expected, participants achieved lower results in time-based than in event-based tasks as well as in regular than in irregular tasks. Contrary to expectations, planning decreased results in all types of prospective tasks. Group and task related factors are discussed as possible explanations for the observed pattern. The differences between laboratory research and everyday prospective memory tasks as well as the role of cognitive charge are highlighted.

Poster Presentation

False memory in aging: visual similarity impacts more healthy elderly adults than semantic proximity

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Objective The present study explores the role of semantic and visual similarity in memory errors in normal aging. **Method** 40 young adults and 40 healthy elderly adults learned 16 words (Exp. 1) or 16 pictures (Exp. 2). In a subsequent yes/no recognition task, targets were presented among distractors. In Experiment 1, the distractors were semantically related to the target (same category vs. related category vs. unrelated category) and visually related to the target in Experiment 2 (same exemplar but a different picture vs. similar shape vs. unrelated shape). **Results** Both groups falsely recognized more of the most closely related distractors than other less similar items. As expected, elderly adults committed slightly more false recognitions than young adults. However, elderly adults were more impacted by visual similarity than semantic similarity, whereas young adults exhibited a similar effect of the similarity regardless of its nature (semantic = visual). This pattern of results was confirmed in reaction-time analysis. Elderly adults were slower than young adults in a whole. Both groups were slower to decide whether the closest distractors were to be learned or not, but elderly adults showed a more pronounced effect in Experiment 2. **Conclusion** Episodic memory emergence depends on the distinctiveness of the memory trace in young and healthy elderly adults. Normal aging is yet more impacted by visual rather than semantic relationship. This sensitivity to visual similarity has been recently explained by hypo-activation of the left perirhinal cortex in aging which is known to be involved in high level visual integration.

Poster Presentation

Providing a novel framework to measure the key components of executive function in DS, with applications for efficient early clinical diagnosis of dementia

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Individuals with Down syndrome (DS) are at a greatly increased risk of developing dementia, specifically early onset Alzheimer's disease. Executive function decline is one of the most consistent early signs of dementia in individuals with DS, as opposed to predominantly episodic memory declines that are often the earliest signs of dementia in the typical population. Detecting decline in executive functions in those with DS is complicated as individuals are expected to have cognitive performance below average prior to dementia. It is vital to obtain baseline measures of executive function for individuals with DS such that it is possible to determine meaningful decline. There are, however, an array of components under the umbrella term of executive functions, and a number of different tasks are used to test these different functions; such differences can lead to different results. The findings regarding executive function in the DS population are very mixed. In this study 20 adults with DS (aged 25-45) and 20 typically developing (TD) children matched for non-verbal mental age will participate. We present a methodology that extracts measures of three core components of executive function using one simple framework, allowing for controlled comparisons of performance across the components of executive function. Specifically, in this single framework we will measure individuals' ability to deal with the memory updating, inhibitory, and temporal components of executive control. We will test participants on two occasions separated by approximately 4 weeks. The reliability of this task in those with DS and TD matched children will be presented, as well as the validity of this novel measure. The potential to use this framework to provide a simplified, fast screening measure to assess decline in DS will be discussed, as well as implications of this for allowing increased efficiency in early detection of dementia in those with DS.

Poster Presentation   **Session B**

The influence of aging on compensatory decision making of different formalization levels: The eye-tracking study

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The results of research on decision making throughout the adult life span show that compared to younger, older adults perform better on less complex tasks containing smaller number of alternatives and apply simplified decision making strategies. We tested empirical predictions concerning the influence of age on compensatory decision making processes and the moderating role of information presentation mode, with the special use of eye-tracking methods. Original tool for measurement of decision making abilities in narrative mode was applied, with consideration of decision environment favoring the use of compensatory strategy. In this environment older adults have demonstrated considerable difficulties in applying more integrative decision making strategy. In our study we applied innovative probabilistic inference tasks including presentation of attribute weights in either formal or narrative version in the form of a computerized information board. Older adults (65-75 years old) and younger adults (20-30 years old) participated in the study. The results showed that older adults performed relatively better in narrative, compared to formal, mode of the task. Moreover, the influence of aging on the performance in decision making task was mediated by the entropy of attributes and entropy of options (concerning fixation times). We also analyzed the mediation and moderation role of additional variables (mental speed - Wechsler's Digit Symbol Substitution Test, intellectual helplessness, subjective and objective numeracy scales, affect measure - PANAS X). The study results have interesting implications for further research and practical intervention methods of decision making processes improvement among older adults.

Poster Presentation   **Session B**

A cognitive-based model of tool use in normal aging

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Two kinds of knowledge, namely, semantic knowledge about tool function and mechanical knowledge are implied in tool use. Those two kinds of knowledge have been extensively studied in patients but none is known about their interaction in normal functioning. The aim of the present work is to fill this gap by proposing a cognitive-based model of tool use in normal aging. Healthy subjects (n = 101; range = 55-86 years) performed three classical tool use tasks (i.e., single tool use and real tool use tasks in choice and no-choice conditions), two mechanical problem-solving tasks, that assessing mechanical knowledge and two semantic matching tasks (i.e., functional and contextual matching), that assessing semantic knowledge about tool function. We conducted linear regressions on tool use, semantic knowledge about tool use and mechanical knowledge tasks with age as predictor to investigate the effect of aging on the context of tool use. Stepwise forward regressions were used to develop a model for predicting subjects' tool use abilities from their performance on mechanical problem-solving and semantic matching tasks. Results showed significant correlations between age and tool use, mechanical problem-solving and semantic matching tasks, confirming the importance to consider aging on studies on tool use. Although semantic matching and mechanical problem-solving tasks were both explaining tool use tasks, mechanical problem-solving tasks appear to be the more relevant predictors among age and semantic matching tasks. This result suggests that, in normal functioning, both mechanical and semantic knowledge are needed to use tool but mechanical knowledge may be more influential than semantic knowledge. Moreover, mechanical knowledge may not be only necessary to use novel tools, but as it is demonstrated in this work, mechanical knowledge may also be necessary use familiar tools too.

Poster Presentation

Hemispheric specialization of semantic processing during normal ageing. A divided-visual field experiment

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Compared to other cognitive functions, language is relatively preserved or even improved with ageing. However, hemispheric specialization (HS) for language shows atypical patterns in elderly, interpreted in terms of compensatory mechanisms and strategies. We used a divided-visual field (DVF) presentation of stimuli with two conditions of presentation, i.e. unilateral and bilateral redundant, to investigate the modulation of (i) hemisphere involvement (unilateral presentation) and (ii) inter-hemispheric asymmetry (bilateral presentation) while participants were involved in a semantic categorization task. Fourteen younger (31-64 y) and 10 older (65-85 y) participants performed the task with verbal (i.e., words) and non-verbal (i.e., pictures) material. Performances (RT and %CR) were analysed with ANOVA and multiple regressions to determine (i) the age effect on the degree of HS, and (ii) the hemisphere which predicts the best the RTs obtained during bilateral redundant presentation. Firstly, the ANOVA analysis showed significant effect of age on HS according to modality of presentation and type of material:, as following: (a) similar HS for non-verbal stimuli in younger and older; (b) right hemisphere (RH) decline in older participants for verbal material. Secondly, the multiple regression analysis showed that (a) during the processing of verbal material by older (compared to younger), the LH (compared to RH) was the best predictor for RTs measured during bilateral redundant presentation; (b) during the processing of non-verbal material by younger (compared to older), the RH (compared to LH) was the best predictor for RTs measured during bilateral redundant presentation. For non-verbal material, an opposite pattern was obtained for older showing that LH was the best predictor. Overall, our results for semantic processing suggest that the degree of HS increases with ageing with supplementary involvement of LH in elderly compared to younger individuals. This over-specialization of the LH might explain the relative preservation of language abilities with ageing.

Poster Presentation

The influence of sleep/wake states on procedural memory consolidation in older adults depends on performance level during initial learning: A neuroimaging investigation

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Although sleep facilitates procedural memory consolidation in young adults, such beneficial effects are diminished with aging. Although the source of this impairment is likely multifaceted, the lack of sleep-related consolidation in older adults may be at least partially attributed to the lower performance levels obtained by older adults during initial encoding. Indeed, research in both children and young adults has indicated that sleep / wake states and online performance on a motor sequence learning (MSL) task interact to influence offline memory consolidation. We thus employed a functional MRI protocol to investigate whether performance levels obtained by older adults (mean age = 62 yrs) during an initial MSL session differentially influenced subsequent memory consolidation across sleep and wake retention intervals. Following completion of an initial MSL session at 11am in the scanner, participants were either afforded a 90-minute nap opportunity (n=28) or were asked to remain awake (n=28). Participants returned to the scanner to complete a MSL retest 5-8 hours after initial training. Results demonstrated no differences in consolidation after a nap or wake interval if participants reached relatively lower levels of performance during initial learning. However, in those who obtained higher performance levels during training, a nap significantly minimized the performance deterioration that was evident across a wake interval. In these higher performing individuals, increased activation in the striatum, cerebellum and parietal cortex during initial learning was beneficial for subsequent offline consolidation if participants were afforded a nap after training but was detrimental in those who remained awake. Collectively, our results indicate that sleep / wake states influence offline motor memory consolidation in older adults only if sufficient performance levels are reached during training and this effect appears to be mediated by recruitment of a striato-cerebello-cortical network during the initial learning phase.

Poster Presentation   **Session B**

The height of power: a transcranial magnetic stimulation study

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This study aims at creating a bridge between neuroscience and social psychology. An increase of motor cortex excitability, known as motor facilitation (MF), is induced by the observation of reachable objects (Cardellicchio et al., 2011; Franca et al., 2012). Previous studies suggest that experiencing a sense of power induce an overestimation of own height (Duguid & Goncalo, 2011). Here we further explored this phenomenon using Transcranial Magnetic Stimulation (TMS) and Electromyography Recording (EMG), in order to infer changes of own height perception from motor facilitation (MF) effects for object in the peri vs extrapersonal space. We carried out two consecutive studies in which Motor Evoked Potentials (MEPs) of twenty right-handed university students were recorded, while they watched and imagined to make some actions on a penknife hanging over them at five different heights: a midline, two in the peripersonal (persipersonal1 and 2) and two in the extrapersonal space (extrapersonal 1 and 2). In study1the MF modulations induced by the different penknifes' positions on a vertical plane were explored. In study2, a power manipulation was introduced to assess eventual changes in the perception of own height as revealed by MF modulations. A 2 (Power: no power/study1, power/study2) x5 (distance: peripersonal 1, peripersonal 2, midline, extrapersonal 1, extrapersonal 2) analysis of variance (ANOVA) was run with intercepts and trials as random factors. A main effect of distance was found with smaller MEPs when the penknife was in the peripersonal than extrapersonal space. Results showed also a significant interaction between power and distance: the significant difference in MEP between peripersonal and extrapersonal1 space disappeared in the power condition. This result suggests that the manipulation of power might have affected the perception of own height, leading to perceive distant objects as being closer.

Poster Presentation

Bayesian Models of individual differences: An example using autistic traits and motion perception

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Bayesian models describe how perceptual experience arises from the optimal combination of noisy sensory information and prior knowledge about the world. Here we probed whether individual differences in perceptual experience are best explained by differences in prior, sensory sensitivity or both. Priors cannot be assessed directly, but Pellicano & Burr (2011) suggested that individuals with Autism Spectrum Disorders may have flatter prior distributions, so we used this as a potential proxy. We collected trait measures of autism alongside psychophysical assessment of the discrimination and perceived slowing of moving stimuli during pursuit eye movement (Aubert-Fleischl phenomenon, AFP), because AFP can be modelled using Bayesian principles (Freeman et al, 2010). The model assumed a motion prior centred on 0 with a given spread, and two sources of fixed internal noise, one for sensory signals estimating pursued stimuli (P) and one for estimating motion with eyes stationary (S). Under these assumptions, smaller differences in threshold between P and S lead to smaller AFP, as would a flatter prior. Hence, individual variation in AFP could arise from independent changes in prior and/or sensory noise. We found that autistic traits were negatively correlated with AFP, reflecting the proposed flatter prior. This relationship was strengthened after controlling for the variance associated with threshold difference. We also found evidence that sensory noise correlated with AFP but only once variation in autistic trait was controlled for, suggesting the influence was small. Finally, threshold difference and the trait measure did not correlate as predicted. Taken together, these results suggest that individual differences in both thresholds and prior distributions contribute separately to differences in perceptual experience. This supports Pellicano & Burr's hypothesis, but also suggests that differences in prior could sometimes mask the relationship between sensory noise and perceptual experience, and vice versa.

Poster Presentation

Groups versus individuals in cue discovery: Who performs better?

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Group decisions and social learning have recently gained interest in the decision making research (e.g. Hertwig & Hoffrage, 2013). Although it has been shown that social exchange can greatly speed up cue validity learning in probabilistic inference tasks (Garcia-Retamero, Takezawa & Gigerenzer, 2009), it is still unclear, in what situations are groups perform better than individuals. Also unexplored is the cue-discovery in probabilistic environments in group-decision making. Klayman (1984; 1988) argued that cue discovery is a significant part of learning from experience. The present study investigates the hypothesis whether group decision making achieves better performance than individual decision making in the cue discovery setting. A total of 42 participants and 14 groups of 3 individuals were examined. The participants were presented with decision problems in a learning game. More specifically, they were shown 21 fictitious rocks (geometric figures) and had to find out which is the most valuable. The geometric figures comprised of three cues (form, size and color), with values for each cue: form (triangle, square, circle), size (small, middle, large) and color (yellow, turquoise, rose). The game includes three phases, with a maximum of 5 blocks each with 20 decisions. In phases 1 and 2 the participants can choose which two rocks they want to compare, in phase 3 they get forced-choice paired comparisons. In phase 1 the participants had to find out, which features are the most valuable and in phase 2 they had to assume, which rock has the higher value on the criterion. The difference to the social decision setting is, that participants could discuss their strategies for 5 minutes after each block. The results about the learning of valid and no valid cues as well as the learning of cue-orders will be presented for discussion.

Poster Presentation   **Session B**

Undoing the past so as to lie in the future – counterfactual thinking and deception

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Counterfactual thinking, the mental simulation of alternatives to reality, can influence a range of different cognitive activities. Apart from influencing the process of problem solving and decision making, studies have also shown that counterfactual thinking plays an important role in moral reasoning. There is however very limited information about the role of counterfactual thinking in moral action. The present study sought to address this by investigating the link between lying and counterfactual thinking. To examine this relationship, we measured individual differences in spontaneous counterfactual thinking and deception as well as individual differences in the fluency of counterfactual and lie generation when cued. A group of 80 participants generated counterfactuals and lies in response to two scenarios. Results indicate that individuals with a tendency to generate spontaneous counterfactual thoughts were significantly more likely to engage in spontaneous deception. Furthermore, individuals who could imagine a greater number of alternatives to the past when instructed to do so were also likely to generate a greater number of lies. The results suggest that the tendency to imagine alternatives to the past might contribute to the ability to generate lies. These findings have implications for understanding the day-to-day functional nature of counterfactual thinking.

Poster Presentation

Avoidance of cognitive demand is function of metacognitive awareness

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In Demand Selection Tasks (DSTs), subjects have to make a choice between two actions associated with different levels of cognitive demand. It has been shown (Kool et. al, 2010) that subjects tend to choose the action associated with the least cognitive demand. To assess whether such a behavior depends on the awareness of the cognitive demand discrepancy between the two actions, we designed two different DSTs using tasks from the numerical cognition domain, the parity judgement and magnitude comparison tasks. In both tasks a SNARC effect can be observed: small numbers are responded to faster with the left hand side and large numbers with the right hand side. Interestingly, participants undertaking the magnitude task usually report being aware of the conflict between magnitude and response side whereas those assigned to the parity task tend not to. Participants performed either a magnitude comparison task or a parity judgment task within a DST task design. Two decks of cards reflected the choice between 80% or 20% SNARC compatible trials. More participants were unaware of the SNARC conflict in the parity judgment task compared to the magnitude comparison task. Only participants who were aware of the difference in cognitive demand between both decks learned to avoid the more demanding deck. Additionally, avoidance was enhanced for participants who were aware of the SNARC conflict. These results suggest that metacognitive awareness of conflict is necessary to show adaptive behavior.

Poster Presentation

When failure doesn't matter: Second chances promote risky investments

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Although the most momentous decisions in life may be those we make only once in a lifetime, the large majority of the decisions we make come with the prospect of having a second chance in case a decision works out badly. Not much is known however about the effects that these second chances have on human judgment and decision making processes. In the current study we investigated the effects of a second chance on investment behaviour and risk preference on a first investment opportunity. To this end we used an investment game based on a model of study time investment on a simulated multiple-choice exam, for either a scenario with a single or two chances to obtain a passing grade. Participants chose the amount of study time to invest and consequently chose the passing probability they were willing to accept. A lower passing probability amounted to a higher possible pay-off, and vice versa. The results showed that providing a second chance causes an increase in risk-taking on a first chance, and this effect was stronger for participants who scored high on the cognitive reflection test, a test of analytical thinking associated with rational behaviour. In addition, we found that the increase in risky behaviour was mitigated when failure on the first chance entailed losing points or when access to the second chance was probabilistic. Taken together, these results show that second chances lead to risky investments on a first chance.

Poster Presentation

How context unfolds over time: Mouse movements reveal preparatory and stimulus-driven response tendencies in the AX-CPT paradigm

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Adaptive behavior involves active maintenance and attentional selection of goal-relevant contextual information and inhibition of even strong goal-incongruent responses. Classical behavioral studies show a strong preparatory attentional expectancy effect and only small interference from stimulus-driven action tendencies on performance, indicated by error rates and reaction times. We focused on how these processes interact continuously over time and influence goal-directed behavior. We tracked mouse movements in a variant of the AX-CPT paradigm to disentangle the unfolding context-related dynamics on overt behavior. Distinct deflections of the mouse movements revealed both the strong preparatory attentional expectancy triggered by contextual cues as well as the stimulus-driven interference triggered by stimuli associated with a strong action tendency. Hence, the mouse movements provided direct behavioral indicators of the ongoing context-related processes on behavior that have been proposed based on simulation data.

Poster Presentation   **Session B**

Distinct neural pathways underlying response inhibition revealed by functional magnetic resonance imaging

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Previous work has highlighted the importance of cortico-subcortical pathways in implementing response inhibition. Specifically, the right inferior frontal gyrus (rIFG), basal ganglia and thalamus have been implicated as crucial to inhibitory control. Yet whether these regions act to support response inhibition only, or a more general system of action updating remains unclear. Here, we explore the role of these structures in inhibitory and non-inhibitory action-updating, with an emphasis on hypothesised pathways proposed to implement response execution and inhibition; the direct, indirect and hyperdirect pathways. A task that assays multiple forms of action-updating was employed in combination with functional magnetic resonance imaging (fMRI). Resultant patterns of activity revealed response inhibition to be associated with lateralised activity at both the cortical and subcortical levels. Specifically, the anterior region of the rIFG, the pars triangularis, was found to be significantly associated with the requirement to inhibit responses. This specificity continued downstream to subcortical loci, where the pattern of activity in sub-structures of the basal ganglia largely confirmed that anticipated for each of the pathways. Importantly, left-hemisphere basal ganglia activity was found to be greater when participants were required to execute a response; conversely, activity was found to be greater in the right hemisphere when participants were required to inhibit a response. Although such lateralisation has been suggested before, this is the first fMRI study to demonstrate how subcortical activity between hemispheres may adapt to situations where response execution and response inhibition is required.

Poster Presentation

Gains and losses in the brain: motor evocated potentials modulation of goal achievement/failure

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A previous study (Pisoni et al 2014) by our group showed that the economic consequences of an observed action can modulate motor evocated potentials' (MEPs) amplitude. Prospect Theory (Kahneman, 1979) posits that when making decisions people typically exhibit greater sensitivity to losses than to equivalent gains. Regulatory Focus Theory instead proposes a goal-attainment perspective on the subjective experiences of gains and losses, i.e., the goal of achieving (avoiding) a maximum gain (loss) in the gain (loss) domain (Higgins, 1997). In order to disentangle among these two theories this study explored whether observing actions with consequences either in the gain or loss domain can differently modulate MEPs amplitude. 24 healthy participants completed 150 trials of a Share Game (SG). SG involved active players ("A") - consisting of five confederates - and a passive receiver ("B"), who was the experimental subject. In each round, "B" met one of the five Players "A". "A" had to decide how to share a gain (SGg) or a loss (SGl) of 50 tokens with "B", by choosing one out of six options, whereby three are gains and three are losses (40/10, 25/25, 10/40 and -40/-10, -25/-25 a-10/-40) where the first and the second number indicate "B"'s and "A"'s share of the tokens respectively). "A" communicated to "B" the chosen option by showing a video clip where an actor grasped one out of six metal cylinders with the chosen allocation displayed on it. While B watched the video, a TMS pulse was delivered to his/her motor cortex and a MEP was recorded from the FDI muscle. Results showed higher MEPs in correspondence to the individual's maximum loss during SGl (-40/-10) and to the individual's minimum gains during SGg (10/40, 25/25). These results suggest a modulation of cortical excitability by the goal-attainment and by loss aversion.

Poster Presentation

Subjective confidence is associated with heightened prediction error responses

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Perceptual decisions are accompanied by a subjective sense of confidence. However, how confidence judgements are constructed remains unclear. We have recently shown that prior expectations bias confidence, such that unexpected perceptual events lead to under-confidence in percept. Motivated by 'Bayesian brain' and predictive coding approaches, we therefore asked whether confidence is associated with perceptual 'prediction error' signals. Theoretically, these signal the mismatch between expected and perceived sensory data. Our hypothesis was that prediction error magnitude would predict subjective confidence judgements in task- or confidence-related brain areas. Under fMRI, participants performed a visual detection task in which prior expectations of target presence or absence were induced. This was achieved by manipulating the probability that the target, a faint peripheral grating, was present relative to absent across blocks of trials. Orthogonally to this manipulation, attention was either focused on or diverted from the target detection by employing a secondary task. Trial-by-trial retrospective confidence judgments pertaining to the detection task were collected. Results showed that BOLD amplitude at the time of grating onset in rdlPFC, rIPL and Cingulate cortex differed both as a function of expectation and confidence. Specifically, BOLD amplitude increased for confident relative to guess trials, and demonstrated a prediction error pattern: an increase in BOLD for unexpected relative to expected perceptual events. Critically, the more expectations biased decision and confidence, the more these areas' responses to confidence depended on prediction error. This effect was such that as the prior expectations became stronger, confidence became associated with greater levels of prediction error than guess responses were. These results suggest that rIPL, rdlPFC and Cingulate cortex may be involved in constructing subjective confidence from prediction error signals.

Poster Presentation

Social exclusion modulates social processing: a behavioural dissociation between facial expressions and gaze direction

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Social exclusion has been proven to drive aggressive behaviours and to create emotional numbness. It also seems to facilitate implicit processing of positive emotions and enhance re-inclusion finalised behaviours. These effects seem to be mediated by the individual's empathy. Nevertheless, the effects of social exclusion on emotions and social information processing are unclear. This study aims to test whether exclusion can improve social processing (i.e., emotion recognition and gaze direction discrimination), and whether this can be modulated by empathy. Young adult participants (M = 15; F = 15) were asked to identify either the emotional [removed] happy, sad, angry, fearful) or gaze direction (direct vs. averted gaze) of photographed faces after social exclusion (or inclusion) through the Cyberball paradigm. Empathy had previously been estimated through the Empathy Quotient questionnaire. Experimental results on response times show that social exclusion slows down emotion identification, but not gaze direction discrimination. Interestingly, higher empathy was associated with a stronger enhancement of social processing in excluded rather than included participants: when excluded, participants with higher empathy scores enhanced the recognition of emotion and discrimination of gaze direction, while for participants with lower empathy scores exclusion made their performance worse in both tasks. When included, participants with higher empathy scores got faster RTs than other participants, in both tasks. This study brings new evidence indicating that social exclusion has an effect only on one of the two crucial social dimensions (emotion identification, but not gaze direction discrimination). Interestingly, empathy also modulates these effects in different ways. This suggests that more empathic people are more sensitive to rejection and pay much more attention to social information.

Poster Presentation

Explicit and implicit affective evaluations of eye gaze

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Eyes and gaze direction play a crucial role in our social interactions. We investigated the effect of another person's gaze direction on observer´s affective responses. In Experiment 1, we used self-ratings and an affective priming paradigm to investigate explicit and implicit affective evaluations of direct gaze, averted gaze, and closed eyes stimuli. Results from the explicit self-ratings showed that participants evaluated closed eyes more positively than direct gaze. However, the affective priming results showed a reversed pattern of results indicating that direct gaze was automatically evaluated more positively than closed eyes. Experiment 2 excluded the possibility that the different stimulus presentation times between the two tasks in Experiment 1 would have led to the opposite patterns of results. In all, these results reveal two interesting findings. First, brief presentations of eye gaze are sufficient to automatically and implicitly evoke affective reactions. Secondly, the different patterns of results in the self-rating task and affective priming task indicate a dissociation between explicit and implicit affective evaluations of eyes and gaze direction. People´s instinctive reaction to eye contact is positive, but this positivity seems to be diminish with more controlled, explicit evaluations.

Poster Presentation **Session B**

Cognitive bias modification and its effect on body satisfaction and body ideals

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We investigated the effect of body size perception training on body satisfaction, personal body ideal and female body attractiveness in women with average to high levels of body dissatisfaction. We used a novel cognitive bias modification technique – body size categorisation task – based on the paradigm developed by Penton-Voak, Bate, Lewis & Munafo (2012). Female participants were randomly assigned to an intervention or control group. Over four consecutive days, all participants engaged in a body size categorisation task, in which they were asked to categorise 15 body morphs into a "thin" or "heavy" category. In the intervention condition, the participants received feedback for their categorisations, which aimed to encourage the perception of thinness in bodies previously categorised as heavy. In the control condition the feedback did not manipulate body size perception. During the follow-up session 2 weeks later, the effects of the training were tested. The results indicated that the training shifted the perception of thinness in the intervention group towards the heavier end of continuum. The attitudes, as measured by the ratings of attractiveness and closeness to personal ideal, also changed as heavier bodies were rated more favourably than before. There was a significant improvement in body satisfaction. There were no changes in the attitudes to bodies, or personal body satisfaction in the control group. The results suggest that modification of body size perception positively affects the attitudes to heavier bodies and leads to an increase in body satisfaction.

Poster Presentation

An Event-Related brain Potentials study of words' emotional valence and arousal on sentence morphosyntactic processing

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Several experiments in the past decades have shown that emotional information strongly impacts on several cognitive processes. Most recently, emotional effects on language comprehension and, particularly, in syntactic processing, have been reported using Event-Related brain Potentials (ERP). However, a great heterogeneity of results has been obtained, probably as a consequence of methodology and stimulation procedures. In addition, very few experiments have employed an experimental design in which arousal and valence are treated as completely independent variables. As a result, it is not clear to what extent valence and/or arousal differently contribute to the observed emotional effects on syntactic processing. The objective of the current experiment is to clarify this issue. To this end, we used emotional words (positive, negative, neutral) preceding neutral sentences that could be either correct (50%) or contain a morphosyntactic anomaly. Preceding words' emotional degree of arousal was matched across positive, neutral and negative valences. Further, to manipulate arousal independently of valence, the preceding emotional words were displayed in different colors and conformed an emotional Stroop task. In this regard, high arousal was achieved when subjects named the colors in which the emotional words were shown; while in the low arousal condition subjects simply read aloud the words. After the neutral sentence presentation, the subject task was to evaluate sentence correctness. ERP analyses showed no overall interactions between arousal and valence, except for an early perceptual P200 component. Arousal manipulation alone triggered an EPN component. Components related to syntactic violations (Left Anterior Negativity, P600) resulted modulated by valence but not by arousal. As a result, emotional effects on syntactic processing appear to be a consequence of the valence manipulation, while arousal (in interaction with valence or independently) would rather affect early perceptual/attentional processes.

Poster Presentation

Happiness and surprise recognition are supported by a left fronto-temporal network: A voxel-based lesion symptom mapping study

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Neuropsychological and neuroimaging studies have demonstrated the role of fronto-temporal regions in emotion processing. However, there are controversial evidence concerning the specific contribution of the right and left hemisphere in emotion recognition and the hypothesis that neural correlates of different emotions may be organized in segregated circuits. The present study assessed facial and vocal emotion recognition in sixteen patients with a left hemisphere (LH) lesion and eighteen patients with a right hemisphere (RH) lesion undergoing brain surgery for tumor resection. Patients' performance decreased after surgery in both visual and auditory modalities. In the facial expression task overall performance was more impaired in left brain-damaged patients, whereas right brain-damaged patients' performance specifically decreased in sadness and fear discrimination. Crucially, voxel-based lesion symptom mapping (VLSM) analyses revealed two segregated regions in the LH accounting for post-surgery scores with happy and surprised facial expressions: lower accuracy for happy faces correlated with lesions in the left inferior frontal gyrus, left insula, and superior and middle temporal gyri, whereas impaired surprise recognition was associated with more dorsal lesions in the left inferior and middle frontal gyri, left insula and anterior corona radiata. In line with the valence hypothesis, these results suggest, in part, different representations of positive and negative emotions in the left and right hemisphere for visually presented but not auditory presented emotions. In particular, our findings add new evidence to the study of the neural correlates of basic emotions showing that deficits in specific expression recognition are associated with discrete cortical lesions.

Poster Presentation Session B

Post-error costs and benefits: The role of the intertrial-interval

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Errors are typically followed by a series of behavioural changes. While slowing down following an error is a robust phenomenon, adaptations in accuracy proved more elusive. In line with previous findings, we show, using a simon-task with random inter-trial intervals, that when inter-trial interval is short, post-error slowing is accompanied by post-error accuracy decrease. However, when longer intertial-intervals are used, smaller post-error slowing and post-error accuracy increase is found. Interestingly this pattern of results also depends on personality characteristics which influence the orienting of attention to threatening information. To investigate whether post-error processing is indeed impaired, when the intertrial-interval is relatively short, the effect of (flanker) errors on early visual ERP components on subsequent stimulus processing was investigated. We therefore combined an error-inducing flanker task with a slower and less difficult frequency task. Again the intertrial interval between both tasks was manipulated. While no influence of previous accuracy was found for both the P1 and N1, measured at Oz, the amplitude of a slightly later N1, at PO7 and PO8, was attenuated following an error compared to following a correct response. The visual N1 has been related to endogenous attention (Hopfinger & West, 2006). In line with the finding of an attentional dip following errors (Houtman & Notebaert, 2013), these results provide evidence for the idea that low-level attentional processing following an error is impaired. While inter-trial interval is often neglected when investigating post-error adaptations, these results add to the idea that the integration of functional and non-functional accounts can offer a comprehensive explanation of post-error adaptations. When the processing time between tasks is quite short, the effect of the still ongoing orienting response triggered by the error, on behaviour is measured, while strategic adaptation can only take place after this initial error detection.

Poster Presentation

Two faces of trait anxiety: Low vs. high trait anxiety is associated with distinctive implicit sequence learning patterns

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Implicit learning of sequential regularities provides clues to predict abstract structure in our environment. How individual differences modulate this process is not fully understood yet. Trait anxiety is associated with an adverse effect on various cognitive tests. However, implicit learning tasks have received less attention so far. The aim of our study was to investigate the relationship between implicit sequence learning and trait anxiety. Participants were selected from a larger sample of healthy young adults (N = 180) and were assigned to two groups. The upper quintile (high trait anxiety, HTA, n = 33) and the lower quintile (low trait anxiety, LTA, n = 40) of the Spielberger Trait Anxiety Inventory (STAI) trait total score were used. Implicit sequence learning was measured by the Alternating Serial Reaction Time (ASRT) task. All participants exhibited significant sequence learning. However, a distinctive pattern of learning emerged between the two groups: participants with HTAs showed greater sensitivity to sequential patterns in terms of accuracy, while participants with LTA exhibited greater sequence learning in terms of reaction time (RT). Lack of correlation between learning effects in accuracy and RT measures excludes the possibility of speed-accuracy trade-off. In summary, trait anxiety appears to affect sensitivity to sequential patterns in a distinctive manner. Our findings can help better understand the interplay between cognition and personality dispositions.

Poster Presentation

Exploring the dynamic relationship between emotion and referential communication

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This study investigated how communicative interaction affects the mood of interlocutors. Previous research has demonstrated a link between emotion and language production showing that positive emotional valence was associated with increased ambiguity of referring expressions (Kempe, Rookes, & Swarbrigg, 2012), – a manifestation of the less deliberate, more heuristic processing style typically found for positive emotions. However, communicative exchanges may extend over considerable periods of time during which mood itself may, in turn, be altered by the process of communication. The present study explored this potential feedback link between dyadic communication and emotion. Dyads of participants were induced into negative mood before participating in a referential communication task. In this task, a Director had to describe a series of depicted objects to a Matcher, who had to select target objects from a set of distractors. The objects were designed so as to require participants to mention three physical dimensions in order to produce unambiguous descriptions. Dyads were randomly assigned to either a Broadcast condition, in which Matchers were prevented from giving feedback and making clarification requests, with roles switching after the entire set of objects had been described by the Director, a Partial Interaction condition, where Matchers did provide feedback, and a Full Interaction condition, where Matchers provided feedback and also roles were switched after each object. Mood was measured before and after the communication task using self-ratings. The results showed a change from negative to positive mood only in the Partial Interaction condition suggesting that being actively listened to, rather than just speaking or taking turns, is inherently rewarding. We further analysed how the trajectory of change in communicative effectiveness was linked to objective measures of non-verbal emotion expression over the course of the exchange to explore the dynamic nature of the reciprocal interaction between emotion and communication.

Poster Presentation

Emotion regulation processes modulate attentional focus: Alexithymic features provide additional evidence for the broaden-and-build model

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Successful emotion regulation is fundamental for a wide range of cognitive processes. In this study we investigate the bi-directional relation between attentional bias and emotion regulation. We focus on the influence of positive or negative emotions in broadening or narrowing our attentional field, as the broaden-andbuild model suggests. Within this context, our experiment used eye-tracking to measure visual attentional preferences to emotional negative pictures, both in alexithymic and non-alexithymic participants. Attentional preference was determined by comparing fixations to the salient area of the picture (e.g. featuring more negative characteristics) with the peripheral areas (e.g. featuring more neutral characteristics). It was already demonstrated that there is an attentional bias for the emotional negative content of picture stimuli: participants tend to disengage from the salient negative part of the stimulus, broadening their attention as a strategy to regulate negative emotions. By contrast, we postulate that since participants with alexithymic traits have limited emotional regulation strategies, they should not be able to strategically broaden their attentional focus, thus remaining engaged with the most negative areas of the picture stimuli. Our results confirm this hypothesis, showing that individuals featuring alexithymic traits fixated more the salient (negative) areas of the stimuli than control participants. The different attentional strategies found in Alexithymic population when dealing with negative stimuli corroborate the strong link between attention allocation and emotional regulation, consistently with the broaden-and-build model.

Poster Presentation

Implicit and explicit measures of food preference in healthy weight individuals

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Maintaining weight loss after dieting has proven challenging with only 20% of dieters maintaining weight loss for over a year. Although, successful weight loss maintainers (SWLM's) are within a healthy weight range (BMI 18-25), they have a very different eating history to always healthy weight individuals (AHW). This unique group are understudied and little is known about their implicit cognition's associated with food preference (liking) and craving (wanting). Prior research with over-eaters has indicated that implicit attitudes about certain foods, when viewed positively or negatively, can strongly influence eating behaviour. This study aims to investigate SWLM's implicit (liking and wanting) and explicit (liking and wanting) attitudes toward high calorie (sweet and savoury) and low calorie (sweet and savoury) foods and their contribution to successful weight maintenance. Implicit liking was measured using four unipolar single category Implicit Association Tasks (SCIAT). This allowed separate measurement of implicit positive and implicit negative affect associations with high and low calorie food images. Implicit wanting was also measured using four unipolar SCIAT's and approach-avoidance word associations to high and low calorie food images. Each attribute in the implicit liking and wanting IAT's were contrasted with a neutral category. For example, the positive attribute 'Like' was contrasted with 'Neutral' and the negative attribute 'Dislike' was contrasted with 'Neutral'. Participants also completed a Food Preference questionnaire (explicit liking) and Food Craving Inventory (explicit wanting) to identify individual food preferences. Preliminary results suggest a gender difference in explicit preference for low calorie foods. Females reported a significantly higher preference for low calorie foods than males. No gender difference was observed for high calorie foods. Preliminary analysis showed a low association between explicit and implicit food preference measures for AHW individuals. The implications of these results and how they can be used to profile eating behaviour will be discussed.

Poster Presentation

Cognitive depletion and moral reasoning

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We report the results of two experiments that examine moral judgments following cognitive depletion. We test the suggestion that people need to exercise cognitive control over their initial emotional reactions in order to decide that they will violate a moral norm for the greater good, for example, to decide to sacrifice the life of one person in order to save the lives of five others. The experiments rely on the idea that cognitive control requires access to mental resources that are limited, and that when these resources are depleted, people are less able to exert control. Accordingly, we predicted that depleting the ability to exert control would reduce participants' tendencies to make moral judgments in favour of the greater good (i.e., 'utilitarian' responses). In one of the experiments 40 participants were assigned to one of two groups: the depleted group completed a difficult writing task which required them to avoid the use of words that have the letter 'a' or 'n' and the non-depleted group completed an easy writing task which had no constraining rules. Participants then made judgments about a set of 12 moral harm and fairness dilemmas, including "up close and personal" emotional dilemmas and impersonal, less emotional dilemmas. Participants in the depleted group tended to make fewer judgments for the greater good to the Impersonal dilemmas, and they took longer to make their decisions overall. These effects were not attributable to mood or thinking style. The results suggest that people may try to overcome automatic reactions to some types of moral dilemmas in order to make "greater good" decisions, and that such attempts may require effortful, cognitive processing to do so.

Poster Presentation   **Session B**

Rumination is associated with a reduced efficiency in cognitive control

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Ruminative negative thought is a characterizing feature of several clinical disorders (e.g., major depressive disorder, insomnia disorder). Despite its clinical relevance, research on the underlying cognitive mechanisms of rumination remains scarce. According to the processing efficiency hypothesis (Eysenck, Derakshan, Santos, & Calvo, 2007), rumination is theorized to interfere with normal cognition by taking up valuable working memory (WM) resources. Consequently, individuals with a tendency to ruminate (i.e., sustained internal attentional focus towards task-unrelated thoughts) will engage more effort to maintain effective task performance at the expense of cognitive efficiency. A recent theory of cognitive control, i.e., the Dual Mechanisms of Control (DMC; Braver, Gray, & Burgess, 2007), proposes that this reduction in the capacity to actively maintain cognitive task goals in WM might be associated with an inability to flexibly switch between different cognitive control modes. In the present study, we investigated whether rumination was associated with a reduced cognitive efficiency in cognitive control, using the AX version of the continuous performance task (AX-CPT). The AX-CPT was administered to a group of undergraduates, classified as high-ruminators (n = 23, 19 females) versus low-ruminators (n = 22, 18 females). The main results showed that although both groups made a similar amount of errors, high-ruminators were significantly slower than low-ruminators on the non-target trials (i.e., BX, AY, BY). The results lend further support that given an equal performance in both groups (similar error rates), rumination is associated with a reduced efficiency (increased reaction time) in cognitive control. The current study adds to the emerging evidence that rumination impairs processing efficiency through a compensatory mechanism that aims to maintain effective task performance. In a next step, we will examine whether this impairment in processing efficiency associated with a tendency to ruminate, also holds true in patients with insomnia disorder.

Poster Presentation

Emotion recognition impairment in alcohol-dependent individuals: A perceptive or associative deficit?

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Impairments in emotion recognition among alcohol-dependent individuals (ADI) could lead to interpersonal problems and social isolation. This may increase the use of alcohol consumption as a coping strategy to face isolation, thus creating a vicious circle. A large number of research shows that ADI misinterpret facial, vocal and postural emotions. However, precisions are limited to understand deficits in emotional intensity estimation. Nonetheless, deficits appear to be stronger in ecological situations, suggesting integration inabilities of multiple stimuli in a coherent precept. In order to determine perspective and associative emotion recognition impairment in ADI, we have created an emotional cross-modal association learning task (E-CMALT). The first phase of the task consists of identifying face and vocal affects. The second phase is dedicated in creating new affective associations between a form and an affective sound. The third phase consists of evaluating cross-modal affect processes through the priming of new associations. Results are still in process. Evaluating impairments in emotion recognition processes may have significant importance in the clinical area. Indeed, creating adapted emotional therapeutic protocols will permit the restoration of emotion recognition capacities. Also, emotion recognition is a primordial factor of emotion regulation. Some authors suggest that individuals with poor affect regulation may show a diminished capacity to handle emotion states and often rely upon maladaptive coping strategies, such as alcohol use, to manage their emotions. Therefore, determining impairments in emotion processes will generate necessary elements for creating innovative therapeutic protocols in alcohol abuse.

Poster Presentation

Language and short-term memory: The role of perceptual-motor affordance

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The advantage for real words over nonwords in serial recall—the lexicality effect—is typically attributed to support for item-level phonology, either via redintegration, whereby partially degraded short-term traces are "cleaned up" with support from long-term representations of the phonological material or via the more robust temporary activation of long-term lexical phonological knowledge that derives from its combination with established lexical and semantic levels of representation. The much smaller effect of lexicality in serial recognition, where the items are re-presented in the recognition cue, is attributed either to the minimal role for redintegration from long-term memory or to the minimal role for item memory itself in such retrieval conditions. We show that the reduced lexicality effect in serial recognition is not a function of the retrieval conditions, but rather because previous demonstrations have used auditory presentation, and we demonstrate a robust lexicality effect for visual serial recognition in a setting where auditory presentation produces no such effect. Furthermore, this effect is abolished under conditions of articulatory suppression. We argue that linguistic knowledge influences short-term memory performance because it enhances the readiness with which verbal material is segmentally recoded via speech motor processes that support rehearsal and therefore affects tasks that involve such recoding. On the other hand, auditory perceptual organization affords sequence matching in the absence of such a requirement for segmental recoding and therefore does not show such effects of linguistic knowledge.

Poster Presentation

Visual and tactile enumeration using both hands, and the effect of numerosity range on enumeration

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Our study explores tactile enumeration using both hands, and investigates the effects of numerosity range (NR) on general enumeration. In Experiment 1, using a custom-made vibro-tactile apparatus, we replicated results of Cohen, Naparstek, and Henik (2014) and again found a moderate increase in RT up to 4 stimuli and then a decrease for 5 stimuli. In Experiment 2 we used a within participantsdesign and compared NR 1-5 and 1-10 in tactile and visual enumeration. The results showed that enumeration for NR 1-5was faster than for NR 1-10, especially for numerosities 4 and 5. Within NR 1-10, in the visual modality the subitizing range was 4, the counting range was from 5 to 9, and there was an end effect of 10 dots. In the tactile modality, when excluding one-hand arrangements, the subitizing range was 2, the counting range was from 3 to 5, there was an acceleration of counting from 5 and on, and there was an end effect for 10 stimuli that was stronger than for 10 visual stimuli.We suggest that NR influences enumeration and that number-hand association (i.e., resulting from finger counting) influences enumeration, resulting in faster counting.

Poster Presentation

Actions Speak Louder Than Words: Enhanced Action Tendencies in Obsessive-Compulsive Disorder: An ERP Study

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Obsessive-Compulsive Disorder (OCD) is characterized by repeated thoughts and behaviors. The present study investigated whether obsessive-compulsive (OC) symptoms are related to enhanced response tendencies in reaction to external stimuli. Response preparation processes were assessed using the eventrelated potential (ERP) component of the readiness potential (RP). ERPs were recorded while 15 participants with OCD and 16 healthy controls performed a variation of the go/no-go task and the stop-signal task using schematic faces (angry and neutral). The OCD group presented with a greater RP slope gradient over centroparietal brain regions, which was enhanced under negative valence, compared to the control group. Furthermore, reaction times (RTs) for go signals were shorter in OCD participants than they were in healthy controls (but no difference was found in RTs for stop signals). Group differences in RP and behavioral RTs remained significant when accounting for levels of trait anxiety. Results support the hypothesis that a stronger readiness for action might characterize OCD, particularly in the presence of threatening stimuli. These findings, specific to OCD and not to anxiety symptoms, may underlie habitual and embodiment tendencies in OCD.

Poster Presentation

Motor imagery can modulate body-specific associations between space and valence

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Social conventions generally associate good things with the right side of space, and bad things with the left. However, individuals tend to associate good things with the more fluent side (i.e. the side of the dominant hand) and bad things with the disfluent side. This internal mapping, however, has been shown to be highly flexible. Performing a bimanual task that is more difficult for the dominant hand, or even observing another person experiencing disfluency on the side of our dominant hand, results in a reversal of the conceptual mapping. In this work we tested whether merely imagining ourselves doing a task where the nondominant hand is more fluent could also result in a reversal of the emotional valence-space internal mapping. Results confirmed our hypothesis: right handed participants who imagined that they were temporarily more fluent with the left hand showed the "left is good, right is bad" association in a subsequent implicit test. The effect was as strong as in a control group who actually performed the task. Motor imagery suffices to change conceptual associations between lateral space and emotional valence.

Poster Presentation

Your hand belongs to me: embodiment of another person's hand in three different bodily illusions

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In recent years it was proved that body representation is plastic, allowing the buildup of illusory effects of embodiment towards external objects, like fake body parts, (such as in the Rubber Hand Illusion, RHI), or even one's own body parts (such as in the Mirror Box setting, MB) by means of multisensory congruent stimulations. However it still needs to be explored whether such embodiment effects are allowed only for external non human objects, one's own body parts, or even for body parts belonging to another person. To answer this question we run three experiments measuring objective (proprioceptive drift), physiological (SCR) and subjective indexes (questionnaires) of the illusion. In the first experiment, the role of visuo-motor integration for embodiment was explored using a modified MB setting where the subject's own hand (typically seen in the mirror reflection) was replaced by the hand of the experimenter which moved synchronously, or not, with participant's hand hidden beyond the mirror. The second experiment assessed the role of pure proprioceptive-tactile information in the development of the sense of ownership and agency for another person's body part, using a somatic version of the RHI. The third experiment employed a modified RHI procedure to assess the contribution of visuo-tactile congruency for the sense of ownership of another person's hand (which replaced the classic rubber hand, as in exp. 2). Results show that a reliable embodiment effect of an alien limb, at both subjective and objective levels, can be obtained in all the above experimental bodily illusions. This suggests that multiple mechanisms, namely visuomotor, motor-tactile, and visuo-tactile integration, can surprisingly expand our own body representation up to the inclusion of body parts that are known to belong to someone else.

Poster Presentation

Disrupting memory trace activation in working memory: Effect of a visual reactivated mask on a complex span task

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Working memory can be considered as the result of several activations in long-term memory (e.g., Cowan, 1988, 1999; Postle, 2006). Grounded cognition theories claim that both working memory and long-term memory are based on perceptual systems (Barsalou, 2008). Behavioral studies highlighted the sensory nature of knowledge in long-term memory, for instance, a visual reactivated mask disrupted the processing of pictures in a categorization task (Rey, Riou, Muller, Dabic, & Versace, 2015). The present study explored the nature of sensory traces activated during a working-memory task. We used a complex span task in which the reactivated mask was presented during the encoding (Study 1) or the refreshing (Study 2) of pictures to be memorized (cf. Time-Based Resource-Sharing model, Barrouillet, Portrat & Camos, 2011). In a first phase, a visual mask was systematically presented with a high-pitched tone and a control stimulus (i.e. a grey square) was systematically presented with a low-pitched tone to create a mask-tone association (the opposite arrangement was used for the half of the participants). In a second phase, participants saw a series of five pictures. After each picture, participants had to read aloud three numbers which appeared sequentially on the screen. Participants were instructed to memorize the pictures so as to recall their names in the correct order at the end of each series. In Study 1, the tones were presented simultaneously with each picture (e.g., "mask condition" with high-pitched tone and "control condition" with the low-pitched tone). In Study 2, the tones were presented during the blank between each number to read. Results showed that lower serial recall performance in the mask condition than in the control condition, this pattern of results was observed in both studies. We proposed that working memory processes, encoding as well as refreshing, induce the reactivation of sensory traces.

Poster Presentation

Movement and time perception within linguistic and non-linguistic domain

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The conceptual metaphor theory postulates that people represent abstract concepts such as power, affect, importance or time by borrowing information from domains that are rich with sensory and motor experiences (i.e., the concrete domains). This reasoning is best advocated by evidence coming from language expressions. For example, people generally describe experience of time using language tied to spatial concepts (e.g. "short lunch", "long trip", etc.). Moreover, besides the observed semantic overlap between space and time domains, prior studies have empirically supported a notion that perception of time is rooted in perception of space. In two experiments, we tested predictions about space and time perception dependency. In the first experiment, we examined the influence of non-linguistic, visually presented information of movement on the time perception. A randomly moving dot was presented on the screen for a fixed time interval, while the distance that the dot traveled was manipulated. We predicted that participants (N = 68) would estimate time intervals as being longer in situations when the dot traveled a greater distance. In the second experiment, the same hypothesis was tested using verbal material. Participants (N = 76) read either "static" or "moving" version of a story about the interaction of two people. While the content of the story was held equivalent, verbs describing movements were manipulated to imply different distances covered by the main character in the story. Similar to the first experiment, we predicted that participants would estimate time sequences as longer when the story implied that action took place over a greater spatial range. Using these methods we observed the effects of movement comprehension on time perception. Results will be discussed within grounded cognition framework and conceptual metaphor theory in particular.

Poster Presentation   **Session B**

Grounding language in the visual system: Visual noise interferes more with concrete than abstract word processing

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Mounting evidence suggests that sensorimotor representations are involved in language processing. However, the precise nature of this link and the importance of sensorimotor systems for language comprehension remain to be thoroughly tested. We used an interference paradigm to probe the recruitment of the visual system during object word processing. If modality-specific visual representations are recruited during spoken word processing then (i) processing visual noise simultaneously should interfere with word processing and (ii) concrete (object) nouns, such as lemon, should be affected more than abstract nouns, such as peace. Participants (N = 50) performed a concreteness judgment task on randomly intermixed spoken concrete and abstract words (N = 104, matched for length, syllables and frequency) while either looking at a blank screen or at visual noise (random Mondrian type rectangular shapes changing at ca. 10hz). In line with our predictions, we observed that visual noise interfered with both concrete and abstract word processing, and crucially more so with concrete than abstract words (word type by visual noise interaction: $p < 0.005$; mean RT difference: 21ms). Our results suggest that spoken word processing, at least in the present task, recruits visual representations. These findings appear to be incompatible with strictly amodal theories of conceptual representation and provide support for the notion that language is grounded in modality-specific systems.

Poster Presentation

Interaction of hand movements and problem presentation on the solution of a problem task

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The embodied cognition approach can be understood as a bidirectional link between the human body and its cognitive functions. For problem solving tasks the embodied approach predicts that movement manipulations can change an initial problem representation by guiding one's gaze behavior, thus potentially improving one's insight into the solution. We tested this prediction in 53 participants with a variation of Luchins' (1942) water jar problem that allows two solutions to each problem task (addition or subtraction). We found an effect of arm movement manipulation on gaze behavior in a baseline measure. Further, we found an effect of the movement manipulation on the problem representation itself and a combined effect of problem representation and problem-congruent movements on problem solutions. Consistent with embodied cognition, sensorimotor information affects the problem representation as well as insight into problem solving.

Poster Presentation

Time-course of contextual modulations on mirror-like motor responses during the observation of everyday actions: Behavioural and neurophysiological measures

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Neuroimaging studies on action observation suggest that context plays a key role in mapping high-level components of others' actions, but little is known about its possible role during simulation of action kinematics and muscular activity. Here, we combined single-pulse TMS and motor-evoked potentials (MEPs) recording to explore whether and with which timing top-down contextual information is capable of modulating facilitation of cortico-spinal excitability (CSE) in response to perceiving low-level motor components of others' actions. We recorded MEPs from forearm and hand muscles while participants watched videos about everyday actions embedded in congruent, incongruent or ambiguous contexts. In addition, we delivered TMS pulses at different delays: 100ms, 300ms and 500ms after action onset. Videos were interrupted before action ending, and participants were requested to predict the course of the observed actions. At a behavioural level, congruent or incongruent contexts improved or decreased, respectively, accuracy in action prediction as compared to ambiguous contexts. This effect was mirrored in a muscle-specific manner only at 300ms, with selective CSE increase or decrease during observation of actions embedded in congruent or incongruent contexts, respectively, as compared to those embedded in ambiguous contexts. Importantly, this effect was only observed for the hand muscle that is specifically involved in reach-to-grasp execution/observation. At 100ms, not muscle-specific contextual effect was observed, suggesting a general modulation of motor activity rather than mirror-like motor responses. Crucially, at 500ms a muscle specific decrease in CSE facilitation was observed only in response to actions embedded in incongruent contexts as compared to congruent and ambiguous contexts, pointing to higher-level modulation of mirror-like motor responses. These findings indicate that motor resonance is not an entirely automatic process, but it can be modulated by high-level contextual representations in a time-dependant fashion, with both, motor facilitation and suppression processes occurring at about 300ms after stimulus onset.

Poster Presentation   **Session B**

tDCS of the ventral premotor cortex affects the Other-centered perception of the extrapersonal space

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We perceive the distance as reduced when adopting a human body, compared to an object, as reference frame. Previous data suggest that when observing a human body with the potential/intention to walk, we simulate the walking action and this changes our space perception. Moreover, a certain degree of interindividual variability in this effect has been observed, which seems to depend on perspective taking (PT) abilities. The ventral Premotor Cortex (PMv) is known to be involved in motor simulation (or motor mirroring) and could play a role in the "social scaling" of the extrapersonal space. Here we performed three different sessions of transcranial Direct Current Stimulation (tDCS) lasting 20 minutes (sham, cathodal, anodal) on the left PMv and we administered the IRI-Interpersonal Reactivity Indexto measure PT. 27 Subjects were divided into two groups (High PT and Low PT) and were asked to judge the location ("Near" or "Far") of a target object from an egocentric reference frame (RF), or an allocentric RF (either a human body or a static object). Stimuli were presented with progressively increasing or decreasing target-RF distance until the subject did not report a perceived change from Near to Far or vice-versa. The results indicate that only in the Low PT group the anodal stimulation reduces the space perception with the human body vs the object, conversely the effect is inverted with the cathodal stimulation. Thus, it seems that the ability to take the other's perspective modulates the impact of the left PMv stimulation during the Other-centered extrapersonal space perception. Specifically, the lower is the PT score, the greater is the impact of tDCS stimulation of the left PMv on the "social scaling" of the extrapersonal space. In conclusion, PT appears to be a prerequisite for the motor simulation to occur and being modulated.

Poster Presentation

How much do weigh 8 gigabytes?

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Many studies have investigated the psychological reality of Conceptual metaphors that have been present in language for a very long time. Here, we tested whether Conceptual metaphors that have recently emerged in our society are also psychologically real. More precisely, we focused our attention on the expressions used to speak about the data recorded on electronic devices. Electronic devices that can record data are spoken of and graphically represented as containers that can be filled with or emptied of data (e.g. "my disk is full" or "this folder is empty"). Thinking of electronic devices as "real" containers should also mean the substantialisation of the data and thus giving it a weight. As a consequence, the electronic device weight perception should be biased when thinking about it as something "full" or "empty". In order to test this hypothesis, we asked participants to evaluate the weight of many real electronic devices. They did their judgments just after having listened a sentence describing the device. It was told to the participants that the sentence read for each device was the sentence the previous owner used to describe it when giving it to us. Participants had to make their judgments based on vision only (without touching the device) and with the use of a likert scale (ten glasses filled to different levels of water to represent the different weights). On two critical trials the electronic devices were the same except for the colour. In one case it was said that its memory was full and in the other case that it was empty. Participants valued the electronic device with the empty compared to the full memory as being lighter.

Poster Presentation   **Session B**

Processing goals moderate the effect of co-occurrence on automatic evaluation

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We tested whether goals during the processing of evaluative information determine the relative sensitivity of automatic evaluation to the valance of co-occurring stimuli versus the relation between the target and the affective stimuli. For example, "Kindness is uncharacteristic of Phil" has Phil co-occurring with kindness, but the relation suggests he is unkind. In Experiment 1 (N=1,248), targets co-occurred with positive or negative behaviors that were characteristic or uncharacteristic of them. In Experiment 2 (N=185), the targets started or ended pleasant or unpleasant sounds. Thus, the valence that co-occurred with targets was sometimes the opposite of the targets' valence inferred from the relation. In both experiments, we found that automatic evaluation was more sensitive to relational than to co-occurrence information when participants were instructed to form impressions than when they were instructed to memorize co-occurrence. This suggests that processing goals moderate the effect of propositional versus associative information on automatic evaluation.

Poster Presentation

Does pupillary contagion reflect mimicry or basic perceptual processes?

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Previous studies showed that we mimic each other's pupil size. If we observe someone with large pupils our own pupil will dilate and vice versa. Further, it seems that this effect is restricted to the observation of certain emotions. Harrison and colleagues (2006) only observed this mimicking effect when sad faces were shown to participants, but not when neutral, happy or angry faces were presented. In line with research on action imitation it has been proposed that we mimic each other's pupil size in order to understand each other. However, here we argue that experiments on pupillary mimicry have neglected a potential confound, namely perceptual processes. Since our pupils automatically dilate when observing darker stimuli, observing larger pupils should already automatically enlarge our pupils. In the first study we show that indeed, perceptual processes can account for the current data. However, if perceptual processes are entirely responsible for the pupillary mimicry effect then this effect should be the same when observing different emotions. We tested this in a second study by replicating the design of Harrison et al. (2006). In contrast to their findings, we did not only observe pupillary mimicry when observing sad faces but also when observing neutral faces. However, there was no pupillary mimicry when observing angry or happy faces. So for the moment we can conclude that both perceptual effects and mimicry effects contribute to the data pattern. The main conclusion of our studies is that perceptual processes should be taken into account when conducting pupillary mimicry experiments so that the role of mimicry and perceptual processes can be disentangled.

Poster Presentation

Interpreting numerically quantified noun-phrases: evidence for children's difficulty with reference resolution

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We report a series of experiments investigating how children and adults interpret ambiguous quantified nounphrases (QNP) such as "two cats" in sentence-pairs such as (1). 1. Three cats were on a wall. Two cats were playing with a mouse. In this example, the QNP "two cats" can refer to either two of the three cats on the wall (i.e., a subset reading) or two other cats (i.e., a new set reading). Frazier et al. (2005), amongst others, present evidence that adults prefer the subset reading of this ambiguity, because it is more referentially parsimonious (Frazier et al., 2005; Wijnen & Kaan, 2006). However, it is unclear whether developing readers exhibit the same interpretative preferences. Our experiments were conducted in Greek; and the results have since been replicated in English. Each experiment employed child (aged 6-8 years) and adult participants. In an initial experiment, participants were presented with sentence-pairs like (1) and unambiguous versions of the sentence-pairs alongside cartoon pictures depicting the new set and subset interpretations, and participants indicated which picture matched the meaning of the sentences. The unambiguous sentence-pairs were disambiguated in favor of the subset reading by including a partitive (e.g., "two of the cats"), and the new-set reading by including the word "other" ("two other cats"). The results showed that children, unlike adults, strongly favored the new set reading, not only for ambiguous QNPs, but also unambiguous QNPs. Further experiments that explored the interpretation of ambiguous and unambiguous QNPs confirmed these findings and showed that, while children can arrive at the subset reading of a QNP, this is strongly dispreferred. Together the findings from these experiments reveal that whereas adults readily establish co-referential links between sentences containing QNPs, children have more difficulty doing so.

Poster Presentation

Knowing and inferring: an event-related potentials study

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In order to achieve both local and global coherence in reading tasks, readers generate fast online inferences. The contents from prior written text (episodic memory) and the reader´s background knowledge (semantic memory) become the main sources for inference generation. In an Event-Related Potential (ERP) study we tested the participants´ ability to make inferences about pseudowords (sequences of letters that resemble real words but are devoid of meaning) on the basis of information delivered or not by a preceding sentence. Thus, in an initial block, words and pseudowords were randomly used to make statements such as: `Birds/Sias fly´. The processing of the word `fly´ elicited a large and sustained negativity between 200-900 ms when preceded by the pseudoword `Sias´ relative to when preceded by the real word `Birds´. This effect, a prolonged N400 response, indexes a frustrated attempt to semantically integrate the target word `fly´ in the context of an unknown concept: `Sias´. In a second experimental block, participants were provided with an initial statement: `Birds/Sias have wings´ inviting them to make an inference on pseudoword´s potential meaning or properties. Under these conditions, the word `fly´ in the sentence: `Sias fly´ no longer provoked a sustained negativity. Our data indicates that participants were able to make fast automatic predictive inferences on pseudowords (in block2) regardless of the initial failure (block 1) to assign them meaning. These results provide further support to psycholinguistic models of discourse processing that contemplate inference making as a critical tool implemented to accomplish coherence in language comprehension.

Poster Presentation

MEGALEX – A new mega-study of visual word recognition: Some preliminary data

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In recent years, psycholinguistics has seen a remarkable growth of research based on the analysis of data from mega-studies of visual word recognition. We present a new mega-study of lexical decision times for French words and nonwords, for which two groups of 40 participants each responded to 14,000 words and the same number of nonwords for a total duration of 20h (divided over multiple sessions). This new mega-study, called MEGALEX, applied the repeated measures design developed by Keuleers, Lacey, Rastle, and Brysbaert (2012). Collected reaction times were submitted to multiple regression analyses in order to study the influence of continuous lexical variables such as word frequency, word length (in letters), and orthographic similarity. These preliminary results were compared with those obtained in another French mega-study using a more classic design, the French Lexicon Project (Ferrand, New, Brysbaert, Keuleers, Bonin, Meot, Augustinova, & Pallier, 2010).

Poster Presentation

Session B

The time-course of visual influences in letter recognition

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This study builds on a specific characteristic of letters of the Roman alphabet, namely that each letter name is associated with two visual formats corresponding to their uppercase and lowercase versions. Participants had to read aloud the name of single letters, and event- related potentials (ERPs) for six pairs of visually dissimilar uppercase and lowercase letters were recorded. Assuming that the end product of processing is the same for uppercase and lowercase letters sharing the same vocal response, ERPs were compared backward, starting from the onset of articulatory responses, and the first significant divergence was observed 125 ms before response onset. Given that naming responses were produced around 415 ms on average, these results suggest that letter processing is influenced by visual information until 290 ms after stimulus onset. This therefore provides new empirical evidence about the time- course of visual letter perception processes.

Poster Presentation

Is d equal to b and different than p? Orientation processing of reversible letters during word recognition

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Learners of scripts with mirrored symbols like the Latin alphabet need to break mirror invariance, an original property of the visual object recognition system that would hinder the recognition of reversible letters (e.g., d and b). Although mirror discrimination is accomplished by readers of these scripts, it remains unclear whether it represents an inhibition of mirror invariance or, alternatively, that mirror invariance is erased in letter processing. Perea et al (2011, JML) have suggested that the former hypothesis agrees with their findings on mirrored priming of a critical letter within a word (ibea – IDEA): facilitatory priming for non-reversible letters (e.g., f) and inhibitory priming for reversible letters. However, this inhibitory effect could rather be due to the activation of an existing letters (e.g., b instead of d), which is incompatible with the target. In this study, we explored this possibility, combining the masked priming paradigm with lexical decision (Experiment 1) and with same-different judgments (Experiment 2). In both experiments, we examined priming effects for both mirrored (e.g., b – d) and plane-rotated (e.g., p - d) versions of reversible and of non-reversible letters. Note that planerotated versions correspond to an orientation-contrast that is critical for letter recognition (i.e., 180o clockwise rotation in the image plane; e.g., p – d) but to which the visual system is originally sensitive to. In both experiments, we found significant inhibitory priming effects for both mirrored and rotated versions of reversible letters, and no priming effect for plane-rotated versions of non-reversible letters. For reversible letters these inhibitory priming effects are due to the activation of an existing letter (e.g., b or p) that is incompatible with the target (e.g., d in IDEA) rather than to inhibition of mirror invariance. Thus, at least for reversible letters, mirror discrimination occurs automatically during word recognition.

Poster Presentation

Accessing two intended meanings simultaneously is easier than accessing a single intended meaning: evidence from puns

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Modular approaches to non-literal language processing suggest that literal meanings are activated obligatorily before intended non-literal meanings are subsequently accessed. Interactive approaches, however, claim that non-literal meanings are accessed directly thus avoiding the processing of irrelevant literal meanings. Does pun processing require more cognitive resources to simultaneously access two intended meanings or is it possible to access two meanings in an efficient manner? We investigated the time-course of meaning activation during pun processing using a 64-channel EEG system. Puns were motivated either by decomposable and non-decomposable idioms. In non-decomposable idioms, idiomatic meanings are unrelated to the literal meanings of the component words (e.g., kick the bucket ≠ die), whereas in decomposable idioms idiomatic meanings are related to the component words (i.e., pop the question → propose). Both non-decomposable and decomposable idioms were used in sentence-final position in idiomatic and punning contexts as auditory primes. Visual targets, related to: (i) the literal meaning of the idiom, (ii) the idiomatic meaning, or (iii) unrelated, were presented with an inter-stimulus interval of 0ms for a delayed lexical decision task. For non-decomposable idioms, ERPs formed relative to the target onset indicated that both literal and idiomatic targets were primed in the pun condition. Conversely, in the idiom condition, literal targets were not primed and idiomatic targets showed interference effects. For decomposable idioms, again both literal and idiomatic targets were primed in the pun condition. In the idiom condition, literal targets were not primed while idiomatic targets showed priming effects. The results for the two targets of decomposable and nondecomposable idioms in the idiom condition have implications for theories of mental representations for idioms. More importantly, consistent with interactive approaches to non-literal language processing, the results for the pun condition suggest that two intended meanings can be activated simultaneously without necessarily incurring additional processing costs.

Poster Presentation

Direct evidence of tDCS effect on cortical excitability and task performance: a TMS-EEG study on verbal fluency

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Several studies report an improvement in language production after anodal-tDCS (a-tDCS) applied over the left Inferior Frontal Gyrus (LIFG). We investigated the neurophysiological underpinnings of this effect by means of TMS-EEG, applied before and after a-tDCS, coupled with a verbal-fluency task. The experiment was run in 3 sessions, performed on separate days. Two TMS-EEG recordings per session were acquired before and after tDCS. In all sessions the anode was applied over F5 (20 minutes, 0.75 mA, 16 cm2), with standard cephalic reference, and phonemic and semantic verbal fluencies were administered during the last 5 minutes the stimulation. TMS was delivered over left BA6, an area involved in the behavioral task. In a control session, the same paradigm was used but sham tDCS was delivered. A further control session was performed applying a-tDCS but targeting with TMS the left BA7, i.e. an area not involved in the task. Local mean field power (LMFP) of TMS-evoked potential (TEPs), a measure of cortical excitability, was computed for seven different anatomically defined electrodes clusters. Moreover, cortical sources were computed by performing a source modeling on TEPs data. Results confirmed an enhanced verbal fluency after real tDCS. Moreover, after real, but not sham tDCS, LMFP increased in the TMS site and in the anatomically connected areas in a late time-window, reflecting a network excitability enhancement. Conversely, in the tDCS site LMFP increased in an early time-window, indicating an increment of local cortical excitability. No increment of LMFP was instead observed with TMS over left BA7, thus confirming the specificity of the tDCS effects, confined within the task-related network. Interestingly, the increment in verbal fluency significantly correlated with increase in LMFP over F5, thus directly linking the behavioral results with tDCS neurophysiological effects.

Poster Presentation

Does noun capitalization in German affect auditory speech perception?

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Learning to read has a profound impact on language processing. In fact, once we are aware of a word´s orthography, it becomes almost impossible to ignore. Judging whether two words rhyme, for instance, is harder when their rimes are spelled differently (rye–tie) than when they are spelled the same (try-cry). It remains unclear, however, whether the influence of orthography on auditory processing extends beyond such overt characteristics to more abstract orthographic features. To answer this question, we took advantage of the mandatory capitalization of nouns in German. We asked German natives to listen to pairs of words and indicate via button press whether the two words shared either their first and/or last sound. Unbeknownst to participants, the two words of a pair, if written, would either both begin with a capital letter (two nouns) or not (one noun / one adjective). Critically, the stimuli were presented exclusively in the auditory modality. Participants were asked to focus on the phonemes at the beginning and end of each word, and were not aware of the capitalization manipulation. Results revealed that, despite the purely auditory nature of the task, pairs in which both words would be capitalized were responded to significantly faster. Since capitalization in German is intrinsically linked to grammatical category (nouns are capitalized, other word classes are not) a control condition was included, confirming that this effect was indeed attributable to capitalization and could not be explained by grammatical category alone. These results demonstrate that the influence of literacy on speech perception reaches even further than assumed so far. Abstract orthographic features not involved in phoneme-to-grapheme conversion affected speech perception, suggesting that those features, when learning to read, become an integral part of a word's lexical representation and are automatically accessed even when the task does not require it.

Poster Presentation

Does the cognate effect depend on the proportion of identical cognates? A study with Portuguese-English bilinguals

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Facilitated processing of cognates compared to noncognate words is a robust finding in studies on bilingual visual word recognition. However, recent research has shown that the direction of this effect can be reversed depending on the degree of orthographic overlap and stimuli list composition (Comesana et al., 2012, 2014; Dijkstra, Miwa, Brummelhuis, Sappelli & Baayen, 2010). For instance, Comesana et al. (2014) observed that, when identical cognates (e.g., piano-piano, in Portuguese and English, respectively) are excluded from the list, an inhibitory rather than facilitative effect emerges. This result is probably due to the influence of language context on lexical activation. Exclusion of identical cognates creates a single language context, enhancing the suppression of the non-target language. As a consequence, greater competition between separate but overlapping orthographic representations of non-identical cognates may generate the observed inhibitory effect. The aim of the present study was to further explore the impact of language context on cognate processing by manipulating the proportion of identical cognates in the stimuli list. To do that, four stimuli lists were created by gradually decreasing the number of identical cognates within the lists. This resulted in four different ratios of identical vs. non-identical cognate words: a) 50-50; b) 25-75; c) 12-88 d) 0-100, respectively. Within lists, cognate words were matched for length, lexical frequency, orthographic and phonological neighbors as well as for the degree of orthographic and phonological overlap. Besides, 80 noncognate words were added to each list and matched accordingly. Portuguese-English proficient bilinguals took part in the experiment. They were asked to perform a lexical decision task in their second language. Results were interpreted in the context of current theories on identical and non-identical cognate word representation and processing. In particular, the implications for the BIA+ model were discussed (Dijkstra & van Heuven, 2002; Dijkstra et al., 2010).

Poster Presentation

The status of consonant and vowels in handwriting production using transposed letters

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Nowwords created by transposing two or more letters (e.g., RELOVUTION) have been showed to be effective at activating the lexical representation of their base words in visual word recognition (Perea & Lupker, 2004). Different studies in word reading and oral production suggest different roles for consonants and vowels. Our suggestion is to employ an equivalent of this procedure to study this issue in handwriting: Recent results of our lab suggest that producing stimuli with transposed-letters, could be a way to investigate issues like letter position coding and identity in written word production. When participants had to write a visually presented pseudoword derived from a word either by transposing consonants or vowels, effects of transposing consonants or vowels were observed in latencies and marginally in durations. We present two experiments using transposed letters. In this case, the task was to produce the correct word from pseudowords with transposition of consonants or vowels in words of two or three syllables. Similarly to the previous experiment, results showed effects of the type of letters that were transposed: The durations for the transposed consonants were longer than for the transposed vowels, and this effect cannot be explained in terms of serial position within the word. This pattern of results is discussed in terms of the possible different roles of consonant and vowels in handwriting and the similarities with both visual word recognition and word oral production, as well as in terms of the notion of cascade processing.

Poster Presentation

Learning to read in Basque: How do language background and cognitive skills influence reading development in bilingual children?

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Studies on reading development in bilingual children indicate several cognitive and linguistic factors may affect reading skills, however it is still unclear how the influence of these factors changes with age and literacy instruction. The Basque Country offers a very interesting region to study bilingual education since children normally attend Basque-Spanish bilingual schools. Here we will investigate whether the children´s language background (Basque-Spanish proficiency, age of acquisition, exposure) will influence reading aloud in Basque at different ages, given that both languages have the same basic grapheme-phoneme conversion rules. To investigate this question, 264 children (grades 1-6) attending schools in the Basque Country completed a battery of tasks measuring: a) reading skills, with a naming task including 80 Basque words and 80 pseudowords, and cognitive skills previously linked to reading development but not previously combined in a single study, such as b) phonological awareness, measured with a phoneme deletion task, c) rapid automatized naming (RAN) and c) the ability to process a number of items simultaneously (visual attention span), as measured with a visual one-back task. Language background information was also provided by the children´s parents and non-verbal intelligence was taken into account. Using a mixed effects model analysis we confirmed the influence of phoneme deletion, RAN, and visual attention span on reading development in Basque, with results pointing to a decreasing influence of phoneme deletion and visual attention span with age but an increasing influence of RAN. An interaction between language background and age indicated that "more bilingual" children were slower than "less bilingual" children in reading acquisition in early but not in later stages. This study sheds light on issues regarding bilingual education as it is the first large-scale study identifying the role of cognitive and linguistic predictors on Basque reading development in a bilingual context.

Poster Presentation

Literacy development in two alphabetically contrasting orthographies: Evidence from Turkish (L1) and English (L2) speaking bilingual children in the UK

I. Raman[1], E. Raman[2]

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[2]Brunel University, Psychology, United Kingdom

The aim of the present study was to examine the acquisition and execution of literacy skills in bilingual English- Turkish speaking school children in the UK. Although substantial research has been conducted in English and other Western European languages, the extent to which two orthographically distinct writing systems in terms of transparency, such as Turkish and English, influence literacy is yet to be explored. While Turkish is characterised by extremely transparent, predictable and context independent grapheme to phoneme representations the same cannot be said for English in which there are irregular, opaque and context dependent representations. The study utilised a battery of tasks , namely, i.) Word / nonword naming; ii.) Spelling; iii.) Digit span; iv.) Rapid Automised Naming (RAN) v.) Phonological awareness; vi.) Letter knowledge in both English and Turkish. Reaction times and errors were recorded. A total of 50 Turkish-English bilingual school children between the ages of 7-11 were recruited from mainstream schools and supplementary Turkish language schools in London. All testing were carried out in the children's school. The inclusion criterion for the was that participants should have received at least two years of instruction in their L2 language. Experimental stimuli were presented using the SuperLab 4.0 experiment generator together with the SV-1 Voice key to measure RTs. Each session was recorded using a USB microphone in order to verify the accuracy of participant responses. Analyses show that literacy skills develop in tandem in both languages in that children with superior skills in L1 also have superior skills in L2 and vice versa. The implications of the findings are discussed within a cognitive developmental frameworks and further implications for applied psycholinguistics are evaluated.

Poster Presentation

The processing of schwa reduced cognates and non-cognates in nonnative listeners of English

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In spontaneous speech, words are often pronounced in a reduced form, with fewer segments or even fewer syllables than they have in careful speech (e.g., yesterday /jɛstədeɪ/ may be pronounced as yeshay /jɛʃeɪ/). Native speakers understand reduced forms effortlessly. In contrast, reduced forms pose serious problems to non-native listeners of low and medium proficiencies. We investigated whether this also holds for highly proficient non-native listeners. Moreover, we investigated whether these listeners are less hindered by reduction when processing words that are very similar to the words in their own language (i.e. cognates) compared to words that are not (i.e. non-cognates). In an English auditory lexical decision task, natives and highly proficient Dutch non-natives of English listened to cognates and non-cognates that were presented in full (e.g., /ˈɪnstrəmənt/ instrument and /ˈsʌməri/ summary) or without their post-stress schwa (e.g., /ˈɪnstrmənt/ and /ˈsʌmri/). Reduced forms were responded to less quickly than full forms by both natives and non-natives, the effect of reduction being equally large for both listener groups. Importantly, the data also suggest that the two listener groups process reduced forms differently, because non-natives produced more errors on reduced cognates than on reduced non-cognates, while natives were equally accurate on both cognates and noncognates. In non-natives, the processing of a reduced English cognate was thus hindered by its cognate status. We argue that, even in highly proficient Dutch non-native listeners, the development of lexical representations for the reduced form variants of cognates was hindered during language acquisition because of the strong link between the Dutch and English representations of the full form of cognates. Apparently, Dutch lexical representations predominantly strengthen the representation of English full forms, which may stimulate non-native listeners to process cognates above all via these full forms, rather than to develop lexical representations for reduced forms.

Poster Presentation

Neural basis of phonological awareness in beginning readers with familial risk of dyslexia - results from shallow orthography

K. Jednoróg[1], A. Dębska[1], M. Łuniewska[1], K. Chyl[1], A. Banaszkiewicz[1], A. Żelechowska[1], M. Wypych[2], A. Marchewka[1]

[1]Nencki Institute of Experimental Biology, Laboratory of Psychophysiology, Poland
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Phonological awareness is one of the crucial skills in reading acquisition, predicting its later success or causing reading problems when weakened. Two recent studies examined the neural correlates of phonological awareness for spoken language in English-speaking typically developing children and in children with dyslexia or familial history of dyslexia (FHD+). Although in both cases the experimental groups showed hypoactivations compared to the control groups, there was hardly any consistency between the studies with respect to the brain regions involved in the task and distinguishing between the groups. Here we examined the neural correlates of auditory word-rhyming in 102 Polish FHD+ and FHD- emerging readers in two groups – first grade and kindergarten (with and without formal reading instruction). FHD+ children in both groups showed reduction of brain activation in frontal and tempo-parietal areas. The differences included a broader network in kindergarteners, suggesting that formal literacy instruction moderates familial differences. Importantly, the only common difference between FHD+ and FHD- children in both age groups was decreased activity in the left dorsolateral prefrontal cortex (DLPFC) in the FHD+ group. Previously, this same region was underactivated in English-speaking children with dyslexia compared to both age- and reading-matched controls. Here, we also found that its activity is negatively related to the familial risk reported by both parents. It seems therefore that irrespective of language transparency, DLPFC plays an important role in the susceptibility to phonological processing deficits in at risk for dyslexia children.

Poster Presentation

Exploring underlying factors of second language speech perception and production

J. Schmitz[1], B. Díaz1, K. Fernández Rubio[1], R.F. de Menezes[1], M. Burgaleta[2], N. Sebastián-Gallés[2]

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Speech perception and production abilities are assumed to be related in theoretical models. However, studies investigating the relationship between speech perception and production abilities in second language (L2) learners show mixed results, ranging from high to moderate correlations to no correlations at all between L2 perception and production skills. The inconsistencies in results suggest that other abilities might be influencing speech perception and production. Here, we investigate whether L2 perception and production are interrelated and whether other skills may be playing a role in L2 perception and production skills. Audio-visual speech integration capabilities may be a relevant factor, presenting speech audio-visually compared to auditory alone has been shown to lead to benefits in discriminating a difficult L2 contrast. Furthermore, some models assume a common learning mechanism for linguistic and non-linguistic tasks, suggesting commonalities between phonological perception and general acoustic abilities as well as speech production and non-linguistic motor abilities. To find the underlying factors of the relationship between speech perception and production, in this study we used factor analysis to find communalities between a variety of speech and non-linguistic tasks. For this purpose, we collected data from 75 early Spanish-Catalan bilinguals varying in their speech perception ability in three speech perception tasks (categorization, gating and lexical decision) involving a difficult second language contrast (/e/-/ɛ/), a production task (picture naming) involving a variety of second language phonemes, electrophysiological discrimination (mismatch negativity) of acoustic (duration, frequency) and phoneme (native, unknown) contrasts, the ability to lip read and use the visual gestures to predict the forthcoming audiovisual signal in the native language (cross-modal prediction) and non-linguistic sensori-motor ability and learning (drawing). Results showed a relationship between L2 speech perception and production tasks with different factors integrating the speech related tasks and a low contribution of non-linguistic measures.

Poster Presentation

Segmentation strategies in silent reading in French children: Developmental approach of the syllable effects

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In French, the syllable seems to be essential in silent reading. However, empirical data remains rare and the syllable frequency effects are sometimes controversial. Here, we thoroughly investigated the role of syllablesized units during reading acquisition from 1st to 5th grade. Children completed two computerized tasks with or without lexical access: a visual masked priming paradigm in a lexical decision task and a visual syllable detection task. Both tasks allowed us to 1) study whether the syllable is an early and robust pre-lexical reading unit; 2) track the developmental changes in the syllable segmentation strategies. We considered as crucial factors the initial phonological and orthographic syllable frequency and the lexical frequency (calculated with two up-to-date and adapted databases; i.e., Manulex and Manulex-infra), the syllable structure and the reading level to determine how, and when, these factors influence and contribute to the syllable-based effects. Our results confirm an early and robust use of syllables as a pre-lexical and segmental units. First, as reading experience and level increase, speed and accuracy improve in favor of a syllable-based processing. Then, the initial syllable frequency has facilitatory effects in 1st and 2nd while it has inhibitory effects from 3rd to 5th grade in task that required a lexical access. But from 1st to 5th grade, the initial syllable frequency is facilitatory in the non-lexical task. These effects has been interpreted in terms of lexical competition. While the systematic use of syllables is found from the 2nd grade, we also showed that syllable-based effects first depend on CV syllables and then on both CV and CVC syllables. Our results provide new evidence about the developmental changes in the role and the use of the syllables as reading units, and clearly define the role of the initial syllable frequency during reading acquisition in French.

Poster Presentation   **Session B**

Literacy deficits in children with specific language impairment: evidence from an alphasyllabary

S. Tiwari[1], P. Karanth[2], B. Rajashekar[2]

[1]Manipal University, School of Allied Health Sciences, India
[2]The ComDEALL Trust, Bangalore, India

Typical development of oral language skills during early years underpins the acquisition of more complex literacy skills acquired in later years. Numerous studies in the past suggest that early language problems are associated with later literacy problems. Children with SLI (CwSLI), therefore, provide us with unique opportunity to unveil such link. Acknowledging the facts that there exists an apparent dearth of literacy-related investigations in alphasyllabaries (an orthography that shares the properties of both alphabetic and syllabic orthographies), and that the orthography plays a crucial role in literacy acquisition, this study aimed to investigate the literacy deficits in CwSLI learning to read Kannada alphasyllabary, spoken in Karnataka, a southern state of India. A group of 15 CwSLI was compared with two groups of control (age-, & languagematched) participants on a range of literacy skills. Our findings showed that CwSLI performed significantly poorer than age-matched control participants on all literacy measures such as reading words and non-words, written spelling, and spontaneous writing, except akshara (the grapheme in Kannada) knowledge. CwSLI also performed significantly poorer in comparison to those in the language-matched control group on various literacy measures, apart from tasks of akshara knowledge and spontaneous writing. Further, a comparison of literacy profiles in participants from SLI in our study revealed consistency with the literature as well as the nature of orthography of Kannada

Poster Presentation

Disentangling the effects of word frequency and contextual diversity on serial recall performance

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[3]University of Minho, Basic Psychology, Portugal

Lists of high frequency words are typically better recalled in order than lists of low frequency words. The word frequency effect is thought to reflect the greater accessibility of item information for high frequency words. However, past studies did not control for the effect of contextual diversity that correlates with word frequency. Contextual diversity is defined as the number of different contexts in which a word appears within a corpus. Recent work shows that it constitutes the best predictor of reading performance and that it mediates the access to lexical items in memory. Furthermore, controlling for contextual diversity can cancel out the effect of word frequency in lexical decision tasks and attenuate it in word recognition and reading tasks. In the present study, we report the first independent manipulation of contextual diversity and word frequency in a serial recall task. We show for the first time that serial recall performance is greater for low contextual diversity words (when word frequency is controlled for) and for high frequency words (when contextual diversity is controlled for). Both effects affected omissions and item errors. In addition, and contrary to past studies on the word frequency effect, we found that high frequency words reduced order errors. We propose that (1) words of high contextual diversity are less well recalled because the retrieval of these words in their episodic context is interfered with by the existence of many associations to competing contexts in long-term memory; and that (2) word frequency affects both item and order errors, thereby questioning the dominant account of the word frequency effect (redintegration account).

Poster Presentation

Inflecting regular and irregular verbs: data from the three Italian Conjugations

A. Mancuso[1], M. De Martino[1], A. Laudanna[1]

[1]University of Salerno, Department of Political, Social and Communication Sciences, Italy

The issue of processing of morphologically regular and irregular verbs has been characterized by the theoretical debate between Dual Mechanism theories (Pinker & Ullman, 2002) and Connectionist models (McClelland & Patterson, 2002). Most experimental data support the idea of a contrast, at least in English and German (Clahsen et al., 1995; Ullman et al., 1997), between a rule-based default procedure, generating regular past-tense forms, and irregular forms stored in an associative network. The present study investigates whether, accordingly to the dual mechanism hypothesis, the regularity/irregularity dichotomy holds in Italian, a morphologically rich language where verbs are organized into three inflectional classes (conjugations), each exhibiting specific sets of inflectional realizations (paradigms) and different degrees of regularity and productivity. An online inflection experiment was carried out, where regular and irregular verbs from the three conjugations were visually presented in the infinitive form (e.g., MANGIARE, to eat) and participants were asked to produce as fast as possible the past-participle form (e.g., MANGIATO, eaten). The results showed a conjugation effect: 2nd class verbs were harder to be processed than 3rd class verbs and 1st class verbs. The conjugation effect was stronger for regular forms. A regularity effect was reported only on accuracy. The results are consistent with previous studies on Italian morphology (Colombo et al., 2004; Laudanna & Gazzellini, 2007; Amore & Laudanna, 2011) and suggest that inflectional processing of verbs, rather than being influenced by the regularity or irregularity of each single verbal form, is affected by morphological properties of the inflectional class they belong to: namely, the specific consistency, robustness, productivity and regularity distribution.

Symposium

A fight against forgetting from working memory: refreshing and removal

E. Vergauwe[1], K. Oberauer[2]

[1]University of Missouri, Psychological Sciences, United States
[2]University of Zurich, Psychology, Switzerland

This symposium is concerned with working memory (WM), an interface capable of holding a limited amount of information in a temporarily accessible state in service of cognition. Historically, there have been two competing views on the loss of information from WM: the temporal decay account and the interference account. According to the first, to-be-remembered information is lost from WM because it decays over time; according to the latter, to-beremembered information is lost from WM because of interference from other information held in WM simultaneously. These accounts do not only differ in the presumed cause of forgetting but also in the proposed mechanism fighting against forgetting. In decay-based accounts, forgetting can be counteracted by refreshing representations of the tobe-remembered information (e.g., Barrouillet et al., 2004); in interference accounts, forgetting can be counteracted by removing representations that are no longer needed (e.g., Oberauer et al., 2012). Refreshing and removal have both been described as attention-demanding processes crucial to a good memory of to-be-remembered information. At the same time, they differ greatly in their implications for how the cognitive system controls the contents of WM: One view states that WM contents drop out of working memory when left alone, and refreshing is needed to keep them, whereas the other view states that WM contents stay when left alone, and removal is needed to get rid of them. This symposium brings together researchers from diverse theoretical backgrounds and will present research that (1) establishes the existence of refreshing and removal, (2) advances our understanding of refreshing and removal and, (3) explores the relationship between refreshing and removal by testing contrasting predictions. Five speakers will present their most recent findings, after which a 20-minutes discussion is planned, with Nelson Cowan as discussant.

Symposium Abstracts

<div style="text-align:right">**09:00 – 09:20**</div>

Refreshing memory traces in the TBRS model

P. Barrouillet[1], V. Camos[2]

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[2]Universite de Fribourg, Psychologie, Switzerland

According to the Time-Based Resource-Sharing model (Barrouillet, Bernardin, & Camos, 2004; Barrouillet & Camos, 2015), memory traces held in working memory are actively maintained through an attentional refreshing mechanism to prevent and counteract the detrimental effect of forgetting due to temporal decay and interference. Within this account, the available attention is directed toward relevant information (items to memorized or processed) and no process is assumed to remove irrelevant information, which disappeared through decay. We present evidence of both (1) the existence of active processes of maintenance through the impact they have on concurrent processing and (2) the absence of any activity on distractors by demonstrating that different levels of cognitive load do not affect in any way their incidental memorization.

Symposium Abstracts

Directing attention to and away from working memory contents: Controlling refreshing in visual working memory

A. Souza[1], K. Oberauer[2]

[1]University of Zurich, Depto. Psychology, Switzerland
[2]University of Zurich, Psychology, Switzerland

Refreshing is the act of directing one's focus of attention to representations in working memory (WM) thereby reactivating them. Refreshing is assumed to be beneficial to memory; nevertheless little is known about how refreshing operates and which form of attention it engages. Here, we investigate the role of refreshing in a continuous color recall task. Across conditions, refreshing was either (1) uncontrolled (baseline), (2) was controlled by presenting attentional cues during the retention interval, and asking participant to refresh items 0, 1, or 2 times (refreshing condition), or (3) was potentially blocked by engaging attention in a secondary task during the retention interval (blocking conditions). The blocking conditions were split into a visual condition (engaging visual attention) and a central condition (engaging response selection). We show that recall improved as the number of refreshing steps directed to the target of recall increased, providing direct evidence that refreshing is beneficial to memory. Directing central attention (but not visual attention) away from WM items impaired recall; this reduction being similar to the one observed from not cueing an item for refreshing in the Refreshing condition. This finding supports the conclusion that refreshing in visual working memory engages central attention.

Symposium Abstracts

Exploring the process of refreshing through the probe-span task: evidence against common conceptions of refreshing?

E. Vergauwe[1], N. Cowan[1]

[1]University of Missouri, Department of Psychological Sciences, United States

How is a set of elements kept active in working memory (WM)? One idea that has gained popularity over the last years is that people use their attention to refresh the content of WM. This process of attention-based maintenance in WM is referred to as refreshing. Previous investigations of this process have either blocked the use of refreshing by requiring participants to perform a secondary task during the retention period or instructed the use of refreshing by requiring participants to "think of" one or more memory elements during the retention period. Consistent with the idea of refreshing, these studies found that memory performance was a direct function of the unoccupied time available to refresh (e.g., Barrouillet et al., 2004, 2007, 2011) and of how often individual items were refreshed (Souza et al., in press). Rather than examining the effect of refreshing on the final outcome (memory performance), the current study aimed at examining the effect of refreshing on the status of the items in WM locally, that is, during the periods of time when refreshing is assumed to take place. In our new probe-span task, using response latencies, access to items in WM was probed at different time points during the inter-item periods available for refreshing. We explore the operation of refreshing by examining how set size functions and serial position curves are modulated by the time available for refreshing. Common conceptions of refreshing predict changes over time in access to items in WM, which did not emerge. The observed invariance in response time patterns seems to go against common conceptions of refreshing and puts new constraints on how the process of refreshing might operate in WM.

Symposium Abstracts

Working memory updating requires active item-wise removal

U. Ecker[1], K. Oberauer[2], S. Lewandowsky[3]

[1]University of Western Australia, Psychology, Australia
[2]University of Zurich, Psychology, Switzerland
[3]University of Bristol, Experimental Psychology, United Kingdom

The ability to keep working memory content up to date is vital for a number of higher cognitive functions, but it is also crucial for the effective operation of working memory itself. Removing outdated or irrelevant information allows focused processing of relevant information, and minimizes interference. However, measuring WM updating is non-trivial. Standard WM updating tasks confound updating requirements with generic WM functions. In this talk, we introduce a method for isolating a process unique to WM updating, namely the active and item-wise removal of no-longer relevant information. In a modified version of an established updating paradigm, to-be-updated items were cued before the new memoranda were presented. Overall, longer cuetarget intervals—that is, longer time available for removal of outdated information—led to faster updating, suggesting that people can actively remove information from WM. In addition to experimental support for the relevance of removal, we discuss individual differences data.

Symposium Abstracts

Mind the post-distractor interval: Testing TBRS and SOB predictions

E. Davelaar[1], D. Sutherland[1]

[1]Birkbeck, Department of Psychological Sciences, United Kingdom

In a series of experiments, we examined the functional significance of the post-distractor interval in the complex span procedure, which involves alternating between cumulative memory encoding and task processing. The basic finding is that memory performance is larger when the post-processing or postdistractor interval is longer. The time-based resource-sharing (TBRS) model and the serial-order-in-a-box (SOB) model differ in their hypothesised processes that operate during this interval: refreshing memoranda or unlearning distractors, respectively. In two experiments, we used a working memory task that involved encoding digits (1.5 sec) and giving lexical decisions to distractors (666ms presentation + 334 ms blank). To manipulate the effective duration of the post-distractor interval, high and low frequency words were used. These words were tested in a final recognition task. Experiment 1 (N = 24) showed no association between memory span and cognitive load, countering the prediction of TBRS. This was due to a lack of a difference in lexical decision times between high and low frequency words. However, memory span was higher when the distractor task involved high compared to low frequency distractors. In experiment 2 (N = 30), distractor words were selected (through a pilot study) to force a difference in lexical decision times. High frequency distractors were responded to slower than low frequency distractors (by design), shortening the post-distractor interval after high frequency words. The recognition task revealed a low frequency advantage, countering the prediction of SOB that the post-distractor interval is used to unlearn distractors. Preliminary findings from two further control experiments will be presented that aim to replicate the findings with a similar and a dissimilar distractor task. These results do not support either theory and highlight that both theories require further development regarding the precise processes that occur in the post-distractor interval.

Symposium

How is serial order coded in working memory?

S. Majerus[1]

[1]Universite de Liege, Psychology, Belgium

Despite extensive empirical research and the proposal of detailed computational models of serial order working memory, the way the human cognitive system encodes and represents serial order information remains an open question. A minimal common denominator of many recent models of serial order coding is the existence of positional markers. In this symposium, we will explore the mechanisms underlying positional marking, by confronting three accounts of serial order coding. A first one grounds positional coding in spatial cognition, based on the observation of spatial constraints characterizing the way serial order is organized and retrieved in working memory. A second hypothesis relates positional marking to numerical coding, on the basis of overlapping behavioral effects and neural substrates that have been observed to characterize the representation of numbers and serial positions in working memory. A third hypothesis grounds positional coding in the activation of long-term sequential structures. In this symposium, we will confront research guided by these three hypotheses (Antoine et al., Guida, and Van Dijck et al., for the spatial account; Majerus & Oberauer, for the numerical account; Smalle et al., and Norris & Kalm, for the longterm structure account) and discuss the commonalities and divergences of these three accounts of serial order coding.

Symposium Abstracts

The mental whiteboard hypothesis on serial order coding in working memory

J. van Dijck[1], E. Abrahamse[1], S. Majerus[2], W. Fias[2]

[1]UGent, Experimental Psychology, Belgium
[2]Universite de Liege, Psychology, Belgium

Various prominent models on serial order coding in working memory build on the notion that serial order is achieved by binding the various items to-be-maintained to fixed position markers. Despite being relatively successful in accounting for empirical observations and some recent neuro-imaging support, these models were largely formulated on theoretical grounds and few specifications have been provided with respect to the cognitive and/or neural nature of these position markers. Here we outline a hypothesis on a novel candidate mechanism to substantiate the notion of serial position markers. Specifically, we propose that serial order WM is grounded in the spatial attention system: (I) The position markers that provide multi-item WM with a serial context should be understood as coordinates within an internal, spatially defined system, (II) internal spatial attention is involved in searching through the resulting serial order representation, and (III) retrieval corresponds to selection by spatial attention. We sketch the available empirical support and discuss how the hypothesis may provide a parsimonious framework from which to understand a broad range of observations across behavioral, neural and neuropsychological domains.

Symposium Abstracts

As my mother used to say: "There can be consequences when playing with SPoARC(s)!"

A. Guida[1]

[1]Universite Rennes [2], Psychology, France

In 2011, van Dijck and Fias exposed the existence of a positional-SNARC (Spatial-Numerical Association of Response Codes) effect: the SPoARC (Spatial-Positional Association of Response Codes). This effect can be observed when presenting verbal items to be remembered sequentially in the center of a screen and asking participants to execute twice a item-probe recognition task in order to vary the left-/right-hand key assignment: the answer "yes" (as the answer "no") is assigned for half of the trials to one hand and for the other half to the other hand. Results show that the elements presented in the first positions are preferentially associated with the left hand responses (faster responses and lower error rates), and the last positions are preferentially associated with the right hand responses (faster responses and lower error rates). This pattern has been interpreted as if verbal items are mentally organized in a left to right spatial fashion, based on the order of presentation: the first item being mentally represented on the extreme left and the last of the extreme right. In my presentation I will review and present data concerning various SPoARC(s) and analyze the consequences of SPoARC(s) at a theoretical level for short-term memory/working memory (STM/WM). The main idea being that order in STM/WM could be coded via the putative spatial positional tags that are associated with each verbal element to be remembered. And it is this tagging process that would cause our memory to SPoARC!

Symposium Abstracts

The link between spatial attention and serial order in verbal working memory

S. Antoine[1], M. Ranzini[1], W. Gevers[2]

[1]Universite Libre de Bruxelles, Center for Research in Cognition and Neurosciences, Belgium
[2]Universite Libre de Bruxelles, Center for Research in cognition and Neurosciences, Belgium

Working memory refers to our ability to actively maintain and process a limited amount of information during a brief period of time. Often, not only the information itself but also its serial order is crucial for good task performance. Several models of serial order emphasize that order is coded through position marking: items are associated with some independent representation of their ordinal position. This view fits with the observation that item and order are functionally and anatomically dissociated. It was recently proposed that these position markers are spatial in nature, with attention involved when searching through the memorized sequence. Here we show that the ordinal position of an item retrieved from verbal working memory modulates performance in an attention task that relies on continuous processing of space, the line bisection task. In addition, we assessed a group of brain-lesioned patients who present a deficit in spatial attention (unilateral spatial neglect) and observed that this deficit is associated with a deficit for order processing in verbal working memory, while item processing remains spared. These data support the dissociation between item and order, and the hypothesis that spatial attention is crucially involved in order processing.

Symposium Abstracts

A Hebb learning approach to developmental differences in language acquisition performance

A. Szmalec[1], E. Smalle[2], W. Duyck[3], M. Edwards[3], M. Page[4], L. Bogaerts[2]

[1]Universite catholique de Louvain, Psychological Sciences Research Institute, Belgium
[2]Universite Catholique de Louvain, Psychology, Belgium
[3]Ghent University, Department of Experimental Psychology, Belgium
[4]University of Hertfordshire, Department of Psychology, United Kingdom

Why do children learn language more easily than adults is one of the most fundamental yet unresolved questions of science (Kennedy & Norman, 2005). The less-is-more hypothesis (Newport, 1990) proposes that children are better language learners than adults because they have less memory resources available. The current study directly addresses the less-is-more hypothesis within a theoretical framework that explains the link between memory and language acquisition, using the Hebb repetition paradigm (e.g., Szmalec, Page, & Duyck, 2012). In the Hebb paradigm, sequences of stimuli (e.g., syllables) are presented for immediate serial recall with one particular (Hebb) sequence repeated on every nth trial. Hebb repetition learning refers to the improved recall for the repeated Hebb sequence compared to nonrepeated filler sequences. Using this paradigm, we conducted a three-session experiment in which we presented auditory sequences of 9 syllables for immediate serial recall to a group of children (8-9 years old) and adults. This Hebb procedure was repeated after 4 hours and again one week later. In the initial learning session, adults outperformed children but the children showed greater saving of the syllable sequences between sessions. During session 2, 4 hours later, children and adults reached similar levels of performance and again, memory savings between sessions were greater in the children. Finally one week later, during session 3, the children outperformed the adults and thus eventually showed better long-term retention of the phonological Hebb sequences. Overall, these findings indicate that children, compared to adult, initially memorize smaller chunks of information but eventually outperform adults because they show better between-session retention (less-is-more). In addition and also in line with the less-is-more hypothesis, we observed a negative correlation between memory span and the amount of saving between sessions. These findings are discussed in the light of sensitive periods for language acquisition.

Symposium Abstracts

The link between numerical codes and serial position codes in working memory

S. Majerus[1], K. Oberauer[2]

[1]Universite de Liege, Psychology, Belgium
[2]University of Zurich, Psychology, Switzerland

Recent studies suggest close links between working memory for serial order and number processing. The aim of this study was to test a weak and a strong account of working memory – number interactions. Following the weak account, number processing and serial order working memory tasks are related because they involve similar sequential temporary activation and comparison processes. Following the strong account, the codes for representing numbers in long-term memory and those used for representing serial order in working memory are the same. A first experiment tested the weak account by having participants carry out a delayed item or serial order recognition task for 5-word memory lists; during the maintenance delay, the participants performed an ordinal number judgment task intended to interfere with serial order retention processes, or they performed a nonword phoneme detection task intended to interfere with verbal item-based retention processes. We observed a significant interference-type by working memory-type interaction, with serial order recognition being specifically slowed in the numerical interference condition, and item recognition being specifically slowed in the phoneme interference condition. A second experiment tested the strong account by having participants learn associations between words and digit numbers; after the learning phase, these words were administered for immediate serial recall, with lists in which the serial position of the words matched or mismatched the learnt numbers. If numbers code serial position information in working memory, then recall performance should be facilitated for the number-serial position matching trials, and decreased for the number-serial position mismatching trials, relative to a control list condition composed of words for which word - color associations had been previously learnt. No evidence was found for this hypothesis, performance being identical across the different list conditions. Overall, the results support a weak but not a strong account of working memory – number interactions.

Symposium

09:00 – 11:00 | Room: Akamas C

Bridging cognitive psychology and artificial intelligence

I. Diakidoy[1], A. Kakas[2], L. Michael[3]

[1]University of Cyprus, Department of Psychology, Cyprus
[2]University of Cyprus, Department of Computer Science, Cypru
[3]Open University of Cyprus, Pure and Applied Sciences, Cyprus

Recently, there has been a renewed interest in Cognitive Artificial Intelligence and Cognitive Computing driven by the realization that work in AI needs to pay closer attention to the processes and outcomes of the human cognitive experience. It is then important to try to bring together Psychology and AI, where the underlying formal computational frameworks and practice of AI is well informed and guided by the empirical work and theoretical understanding of Cognitive Psychology. This symposium aims to contribute in this effort of bridging Cognitive Psychology and AI. It will concentrate on the cognitive processes of comprehension and generally of inferencing from direct experience and background world knowledge by examining the development of formal representation and computational frameworks that would be needed to underlie the automation of such cognitive processes. Such frameworks would need to bridge the distance between psychological theorizing that tends to occur at a level of specificity that is not sufficient for fine-grained computational modelling and AI approaches that cannot easily adapt to the flexibility and the efficiency of human cognition which primarily concern and constrain the empirically-based theoretical work in psychology. For example, research on story comprehension has documented the importance of relevant background knowledge activation and the generation of coherence-building and elaborative inferences that become part of the mental representation readers construct. However, what aspects of potentially vast amounts of knowledge are relevant enough to activate at any given point in the story? Given human cognitive limitations, which parts of the story are encoded and which inferences are generated? And, if comprehension is an interpretive process, then how can the expected variability in the resulting mental model be predicted in a principled way? These are thorny issues that AI research must address borrowing from, extending, and, ultimately, informing psychological theories and methods.

Symposium Abstracts

When creativity research meets artificial intelligence

A. Jordanous[1]

[1]University of Kent, School of Computing, United Kingdom

Computational creativity is a multi-disciplinary field of research bringing together AI, cognitive psychology and several other disciplines. Creativity is considered as a manifestation of intelligence that we can aim to model or simulate artificially through computational means. For example, computational creativity research has resulted in software that can write poetry, compose and improvise music, perform mathematical reasoning, do creative design tasks or tell stories. Other strands of research focus on creativity support tools, or formal modelling of creativity. In this talk I shall explore how psychological theories about human creativity can inform and support practical computational work. To focus computational creativity research goals and to evaluate research progress in appropriate ways, we seek a clear interpretation of what creativity constitutes. Psychology research, though, highlights the non-triviality of understanding creativity, with various debates and a lack of consensus. AI offers new ways of contributing to the psychology research it borrows from, by testing frameworks and theories computationally. Such collaboration assists progress towards the mutual goal of understanding creativity. I shall give an example where computational research has supported a theoretical model of creativity in music improvisation. I shall also comment on parallel developments in AI and in our understanding of creativity. Philosophical reflections on the meaning of concepts like creativity guide us towards a more dynamic, contextual and embodied understanding of what creativity is. Similarly, recent dynamic, emergent and/or evolutionary based approaches to AI have influenced many computational creativity researchers. I believe that these like-minded paths of progress can mutually contribute to our understanding of the human cognitive experience of creativity.

Symposium Abstracts   09:20 – 09:40

Towards which Intelligence? Cognition as Design Key for building artificial Intelligent Systems

A. Lieto[1]

[1]University of Torino, Department of Computer Science, Italy

In the last decades, the research in Artificial Intelligence (AI) has reached remarkable results in a variety of fields (such as, for example, in theorem proving or in deep learning etc.). Despite these results, however, the realization of artificial systems endowed with human-level intelligence (McCarthy, 2007) is still far from being achieved. Given this state of affairs, in recent years, the area of cognitively inspired artificial systems has attracted a renewed attention both from academia and industry (Lieto and Cruciani, 2013, Vernon 2014) and the awareness about the need for additional research in this interdisciplinary field is gaining widespread acceptance. By following this line, I will argue that the results coming from the cognitive research can be plausibly used, in a functionalist perspective, as a design constraint for the realization of artificial systems aiming at developing plausible forms of human-level intelligence.   In addition, I will argue that the <> approach can be also useful to detect and discover novel aspects of the cognitive theories, thus helping to progress towards a deeper understanding of the foundational roots of intelligence (both in natural and artificial systems).   References - Lieto Antonio and Cruciani Marco (Eds.), Proceedings of the First International Workshop on Artificial Intelligence and Cognition (AIC 2013), CEUR-ws, Vol. 1100, pp.1-171, 2013. - Mc Carthy John, From here to human-level AI, Artificial Intelligence, 171 (2007). - Vernon David, Artificial Cognitive Systems, MIT Press, 2014.

Symposium Abstracts   09:40 – 10:00

IBM Watson and cognitive computing

M. Gemander

With Watson IBM pioneered and delivered the first public deployment of cognitive computing.He will provide some key insights of IBM´s journey towards cognitive computing and deployments in Healthcare sector. Watson is used in several world class oncology hospitals. For cognitive psychology, he will explore Watson's potential in for uses in mental health analytics and big data processing, including potential to reduce the impact of several common psychology related fallacies.

Symposium Abstracts   09:40 – 10:00

Symposium Abstracts   10:00 – 10:20

Knowledge Structure and Activation in Story Comprehension

I. Diakidoy[1], A. Kakas[2], L. Michael[3]

[1]University of Cyprus, Department of Psychology, Cyprus
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[3]Open University of Cyprus, School of Pure and Applied Sciences, Cyprus

Theories of comprehension highlight the activation of relevant prior knowledge as critical for the comprehension of any text. Nevertheless, they under specify and/or advance hypotheses based on implicit assumptions regarding the extent of the available knowledge that is activated during reading, the degree to which representational coherence drives its activation, and the structure of the knowledge activated. All three reflect important considerations when the aim is to build a computational system capable of (even simple) story comprehension. We aim to specify further the extent, the structure, and the coherence-related function of the activated knowledge using a computationally productive methodology and to use this to inform our computational approach (and implemented system) to story comprehension. In a psychological study, sixty-eight undergraduates read short stories on an interactive platform and recorded the knowledge they activated to understand each sentence by selecting from a set of simple and complex rule templates representing productions and causal relations. Students were free to fill out as many rules needed to represent their knowledge. Results indicate a preference for a limited number of simple (single premise) productions (if-then) representing primarily conceptual associations as opposed to thematic ones. Although more rules focused on current sentence concepts, there were notable attempts for establishing coherence by carrying over inferences and information from previous sentences. The implications regarding the extent, the coherence function, and the structure of the underlying knowledge are discussed in relation to theoretical accounts and computational knowledge representation for story comprehension. The potential significance of these findings in the automation of story comprehension is examined using the STAR system approach of story comprehension through argumentation.

Symposium

How cognition supports social interaction: From joint action to dialogue

D. Kourtis[1], G. Knoblich[2], J. Holler[3], N. Sebanz[1], C. Vesper[1], S.A. Ruschemeyer[4]

[1]University of Ghent, Department of Psychology, Belgium [2]Central European University, Department of Cognitive Science, Hungary [3]Max Planck Institute for Psycholinguistics, Language and Cognition Department, Netherlands [4]University of York, Psychology Department, United Kingdom

Cognitive psychologists increasingly realize that human cognition is geared towards supporting social interaction. Accordingly, a growing number of studies addresses perception, action, and cognition in situations where people act together, learn from each other, or communicate with one another. Many of these activities put specific requirements on cognitive processing that are absent or different when individuals think and act alone. The symposium will provide an overview of some recent advances in research on joint action, joint learning, and dialogue that has added to our understanding of how cognition supports social interaction.

Symposium

Symposium Abstracts

Partial representation of a co-actor's task during joint action planning: Evidence from EEG studies

D. Kourtis[1]

[1]Ghent University, Experimental Psychology, Belgium

Successful human interaction benefits from and often depends on the creation of a joint action plan, which may include in addition to the representation of one's own action, the representation of the actions of the other persons, who are involved in the interaction. Previous work in action perception suggests that an action that is performed by another person's is represented (often in advance) in a qualitatively similar way as one's own action. I will discuss findings from two EEG studies, which investigated representations of own actions and others' actions during the planning phase of simple everyday joint tasks, such as passing an object and clinking glasses with another person. The results showed that people employ their sensorimotor system to represent in advance the action of a co-actor. Interestingly, such representations depend on the specific task of each person who is involved in the interaction and they only concern the aspects of the action that are necessary for the successful performance of the interaction. These findings point towards a more efficient and task-specific sensorimotor representation of another person's upcoming action, which may take place concurrently with the planning of one's own action and may facilitate the performance of a joint task.

Symposium Abstracts

Perception-action links from a group perspective

N. Sebanz[1], V. Ramenzoni[1], G. Knoblich[2]

[1]Central European University, Cognitive Science, Hungary
[2]Central European University, Department of Cognitive Science, Hungary

Coordinating actions with others and imitating their actions are fundamental building blocks of social interaction and cultural transmission. Research on the mechanisms that allow us to coordinate with and to imitate others' actions has focused on perception-action links between two individuals. However, many social interactions involve individuals trying to adjust to and learn from actions performed by two or more individuals. We investigated how observing joint actions compared to individual actions affects imitation (Study 1) and synchronization (Study 2) when individuals act alone and in pairs. In Study 1, pairs of participants responded to hand movements that were performed by two individuals who used one hand each or to hand movements performed by a single individual who used both hands. The results showed larger imitation effects when groups responded to group actions than when groups responded to otherwise identical individual actions. In Study 2, participants were instructed to perform individual or joint tapping movements in synchrony with individual or joint tapping movements that continuously increased in tempo (from 1.75 Hz to 3 Hz). Joint performance in terms of spatial accuracy was more accurate when observing joint action than when observing individual action, while individual performance was more accurate when observing individual action than when observing joint action. Taken together, these findings indicate that the match between the number of observed agents and the number of interaction partners selectively affects the ability to imitate the spatial and temporal structure of observed movements. Perception-action links at the inter-group level thus play an important role in supporting different forms of social interaction.

Symposium Abstracts   09:40 – 10:00

Modulations of action performance to communicate to a joint action partner

C. Vesper[1]

[1]Central European University, Department of Cognitive Science, Hungary

How do people coordinate actions such as lifting heavy objects together, clapping in synchrony or passing a basketball from one person to another? In many joint action tasks, verbal communication is not needed or simply too slow to provide useful cues for coordination. Instead, two people who coordinate their actions towards a joint goal often adapt the way they perform their own actions to facilitate performance for a task partner. These adaptations can be communicative such that by modulating pragmatic actions, joint action partners deliberately provide information about their own action goals to their co-actors. I will present recent findings from motion tracking studies with adult dyads to demonstrate how communicatively exaggerating aspects of one's own movement such as amplitude or timing can support interpersonal coordination. I will conclude by briefly discussing how the availability of perceptual information shared between co-actors plays a critical role in determining whether and in which way such communicative action modulations are used.

Symposium Abstracts

Gesture, gaze and the body in the coordination of turns in conversation

J. Holler[1], K.H. Kendrick[2]

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[2]MAX PLANCK INSTITUTE FOR PSYCHOLINGUISTICS, Language & Cognition, Netherlands

The primordial site of conversation is face-to-face social interaction where participants make use of visual modalities, as well as talk, in the coordination of collaborative action. This observation leads to a fundamental question: what is the place of multimodal resources such as gestures and eye gaze in the coordination of speaking turns in conversation? To answer this question, we collected a corpus of triadic face-to-face interactions between adult native English speakers, with the aim to build on existing observations of the use of visual bodily modalities in turn-taking and conversation. The corpus retains much of the spontaneity and naturalness of everyday talk while combining it with state-of-the-art technology – eye-tracking glasses, high definition video cameras, and head-mounted microphones – to allow for detailed analyses of verbal and visual conversational behaviours, including their precise timing. A particular focus is on the extent to which these bodily signals may be guiding the projection of upcoming turn boundaries as well as current and next actions. Amongst others, our analyses of gestures show that almost a quarter of gestures accompanying questions begin before any vocalisation has occurred, that they frequently retract before the speaking turn ends, and, crucially, that turn transitions are faster following turns with a gestural component. This provides quantitative evidence to the notion that gestures may indeed have projective potential and thus may play a core role in the coordination of conversation. Our analyses also show that gaze behaviour in triadic interactions is systematically patterned around turn transitions, linked to participation status, and playing an important coordinative function, too. Analyses in progress focus on the relative timing of gaze and gesture at turn transitions. In all, this project elucidates the role of multi-modality in the organisation of turns at talk and in the cognitive processes that underlie this organisation.

Symposium Abstracts

Listening between the lines: Theory of Mind network drives neural motor activity during indirect request processing

S. Rueschemeyer[1], M. van Ackeren[2]

[1]University of York, Psychology, United Kingdom
[2]University of Trento, CIMeC - Center for Mind/Brain Sciences, Italy

As humans we are inherently social and communicative beings, and language is arguably our most direct mode of communication. Words can be seen as pointers to specific semantic information, and they can be used to elicit mental representations of past experiences with a words referent. However, we often use words to mean things other than the word's direct meaning: for example the words in the statement "it's hot in here" provide a description of the temperature in a room, but directed at someone standing near a closed window the speaker could very well actually mean "could you please open the window?" We know very little about the neuro-cognitive processes involved in extracting what a speaker means from an utterance in which speaker meaning and word meaning diverge. In this talk I will present data from two fMRI studies which investigated the neural networks involved in interpreting indirect requests for action (e.g., "It is hot in here" as a request that a window be opened). In both we uncover a complex interaction between the cortical network supporting Theory of Mind (ToM) and areas supporting both language comprehension and lexical-semantic representations. In particular, we using dynamic causal modelling we demonstrate that parts of the ToM network drive activation in brain areas representing propositional content (i.e., the speaker's meaning), as well as inhibiting language areas which may transiently represent the unintended direct meaning of the words presented. These studies provide insight into how social cognition affects language comprehension. Critically they demonstrate that processing language in which speaker meaning needs to be inferred is not the same as processing an utterance in isolation.

Symposium

09:00 – 11:00 | Room: Lara A - B

Relationship between attentional set and task-set

S. Monsell[1], A. Lavric[1], M. Eimer[2], D. Rangelov[3], I. Koch[4], T. Tollner[5]

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[4]RWTH Aachen Universitat, Lehrstuhl und Institut fur Psychologie, Germany
[5]Ludwig-Maximilians-Universitat Munchen, Department of Experimental Psychology &School of Systemic Neurosciences, Germany

To perform any cognitive task requires adoption of a task-set. Task-set control involves the selection and application of numerous task parameters, including orientation to appropriate locations, attention to relevant stimulus attributes and objects, as well as selection of S-R rules or translation operations, and of effectors. Investigators of taskswitching have tended to attribute the well-known costs of switching between tasks to the difficulty of applying the S-R rules appropriate to the current task in the face of competition from S-R rules activated by performing the other tasks in play. But there is growing evidence that difficulty in shifting attention between dimensions, locations, features, objects or processing pathways, can make a major contribution to task-switch costs. This in turn suggests closer consideration of commonalities between work on task-set control, and work on attention shifts in visual search, listening in multi-speaker environments and other paradigms not usually described as addressing task-set control. There is also new research on how attentional parameters are represented alongside other task-set parameters, and on how attentional set is represented in working memory. The speakers in this symposium will address the relation between control of attentional set and other aspects of task-set control.

Symposium Abstracts

Attention as a task-set parameter, and "attentional inertia" as a source of performance costs

A. Lavric[1], S. Monsell[1], C.S. Longman[1], H. Elchlepp[1]

[1]University of Exeter, Psychology, United Kingdom

Task-set is by definition multi-parametric, including perceptual selection parameters and rules for processing attended attributes. We review three strands of experiments in our lab exploring attentional parameters of taskset. In the first, changing the relevant visual dimension — a letter string's lexical properties versus its colour pattern or a single letter's colour versus its identity — yields substantial delays in processing the relevant dimension on the switch trial, as indexed by EEG indices of dimension-specific processing, even after ample opportunity for preparation. This "attentional inertia" accounts for a substantial fraction of the RT task switch cost. A second strand examines spatial attention as a component of task-set by linking three classification tasks to different display locations and tracking eye-fixations of task-relevant and -irrelevant locations after a task cue. A task-switch delays orienting to the task-relevant location, and attentional inertia is manifest in fixations of the previously relevant location, even after a long preparation interval. Both effects can be eliminated if attention is 'decoupled' from the rest of task-set by signalling the relevant location with quasiexogenous cues (e.g. arrows), but at the 'price' of increasing the RT switch cost. Spatial attentional inertia (but not the RT switch cost) can be eliminated by giving participants control of the preparation interval. A third strand requires participants to shift only attentional parameters from trial to trial, keeping other components of the task constant. Participants heard two easily discriminable familiar voices simultaneously saying different digits, and were cued to classify the digit spoken by one voice as odd/even. There were marked costs of switching between voices, but no benefit of preparation, in keeping with some other recent findings on pure attention switching. Overall, attentional inertia can contribute substantially to task-switch costs and is in some cases resistant to being overcome by proactive reconfiguration.

Symposium Abstracts

Feature-based and object-based control of visual search

M. Eimer[1]

[1]Birkbeck College, University of London, Psychology, United Kingdom

The selection of target objects in visual search is controlled by attentional templates. Such search templates specify currently task-relevant features or objects, are activated in visual working memory during the preparation for a search task, and control the allocation of spatial attention to template-matching objects in search display. Attentional templates guide search efficiently when they specify a single target feature, and when only one template-matching object is present in a search display. The template-based control of visual search is more challenging when target-defining features are variable, or when search displays contain several objects with target-matching features. In the research presented here, we used the N2pc component as an electrophysiological marker of attentional object selection to track the time course of attentional control during single-feature versus multiple-feature search, and in response to search displays that contain several candidate target objects. When two targets that are defined by the same attribute (e.g., red) are presented in rapid succession, both are selected rapidly and in parallel, with each selection process following its own independent time course. When these two objects are defined by different features (e.g., a red target followed by a green target), requiring a switch between colour-specific templates, switch costs for attentional target selection arise, but these are remarkably small, suggesting that the substantial behavioural colour switch costs observed in this task are generated at a post-selection stage. In a second set of experiments, observers searched for targets defined by a conjunction of features, and search displays contained two objects with template-matching features (a target and a partially target-matching nontarget) among distractors. Here, attention was initially allocated in parallel to both objects before it started to become focused on the target, reflecting the transition from feature-based to object-based attentional control.

Symposium Abstracts

If it ain't broke, don't fix it: Task-set components are re-used across different tasks

D. Rangelov[1], H. Müller[1, 2]

[1]Ludwig-Maximilians-University Munich, Department of Psychology, Germany
[2]Birkbeck College, Department of Psychological Sciences, United Kingdom

Task-sets are conceived of as a set of cognitive control parameters controlling human performance in both everyday situations and psychophysical paradigms. To perform any task, e.g., making a cake, controlling at least three processes is necessary: (i) finding the task-relevant item, e.g., finding eggs and milk, (ii) analysing task-relevant attributes, e.g., are the eggs and the milk still fresh, and (iii) choosing task-appropriate responses, e.g., mixing the ingredients. Many studies have shown that having to switch between tasks, e.g., from mixing to baking, incurs costs in speed and accuracy. Little is known, however, whether task-switching requires changing all task-set components (selection, identification, and responding) or different components can be altered independently. Put differently, it is unclear whether task-sets are integral representations or a loose agglomeration of relatively independent components. The agglomerated task-sets predict a possibility to re-use some components across different tasks, and to alter only those settings that require a change. We investigated this prediction using a cued task-switching paradigm and multi-item visual search displays. On some trials, one item (the target) was unique either in colour or orientation relative to non-targets. Participants had to either detect the target's presence or to discriminate its distinguishing feature. Across two trials the task (detection vs. discrimination) and the task-relevant dimension (colour vs. orientation) could repeat or switch randomly. Consistent with the agglomerated task-sets, even on task-switch trials participants were faster for dimension repetitions relative to changes. Similarly, even on task-switch trials the peak latency of the PCN ERP was shorter and the amplitude of the SPCN was lower for dimension repetitions relative to changes. Together, these results indicate that parameters controlling the selection (the PCN) and the identification (the SPCN component) of task-relevant stimuli are re-used between tasks and support the notion of agglomerated task-sets.

Symposium Abstracts

Decomposing task set: Exploring cognitive control in attention and perception-action mapping using task switching

I. Koch[1], M. Kreutzfeldt[1], V. Lawo[1], D. Stephan[1]

[1]RWTH Aachen University, Institute of Psychology I, Germany

Implementing and performing a task requires cognitive control to establish a corresponding mental task set. This set serves to bias input processing (i.e., attentional control of perception), establish required perceptionaction mappings, and to ensure proper action execution (motor control). Here we review studies designed to isolate particular elements of task set. Specifically, we report studies on the flexibility of attention in selective listening and crossmodal switching tasks. We also report studies exploring control of between-task crosstalk in perception-action mappings. Based on these findings, we conceptualize task set as an emergent property resulting from facilitative and inhibitory biasing of task-specific representations.

Symposium Abstracts

10:20 – 10:40

Distractor templates in visual search: When they facilitate attentional selection and when they do not

T. Töllner[1, 2]

[1]Ludwig-Maximilians-University Munich, Department of Experimental Psychology, Germany
[2]Ludwig-Maximilians-University Munich, Graduate School of Systemic Neurosciences, Germany

In order to select an action-relevant object (e.g., a green apple) in a cluttered scene, it is generally believed that people first create a mental representation of the desired object in working memory–i.e., an attentional set or template–which mediates selection via global biasing of feature analyzers that are specialized for coding target-matching properties (e.g., colour: green; form: circular). One actively debated issue in cognitive psychology centres around the type of information that can be integrated by attentional templates to improve search behaviour. Contemporary perceptual decision-making models, for instance, envisage attentional templates to bias perceptual coding and selection decisions exclusively through target-defining feature coding. The underlying idea is that location-specific analyzer units accumulate sensory evidence towards a selection criterion faster the more precise a given object in the visual scene matches the internal target template. This notion directly predicts, however, that search times remain unaffected whether or not participants can anticipate the upcoming distractor context. Here we tested this hypothesis by employing an illusory-figure localization task that required participants to search for an invariant target (i.e., Kanizsa-square) amongst a variable distractor context, which could change—either randomly (Experiment 1) or predictably (Experiment 2)—as a function of distractor-target similarity. Consistent with influential models of perceptual decisionmaking, we observed a graded decrease in internal focal-attentional selection times (indexed by N2pc/PCN timing)—correlated with behavioural response latencies—with increasing physical dissimilarity between target and distractor items. Challenging this influential notion, however, these context-driven effects were behaviourally and cortically amplified for targets of low, but not intermediate and high, similarity when participants could reliably predict the type of distractors. This interactive pattern demonstrates that searchguiding templates can integrate information about distractor identities to optimize distractor-target competition for selection—but only if distractor and target items are sufficient physically distinct from one another.

Symposium

09:00 – 11:00 | Room: Amoroza A

Unconscious influences on goal-directed cognition

L. Ball[1], G. Georgiou[2]

[1]University of Central Lancashire, School of Psychology, United Kingdom
[2]University of Hertfordshire, Department of Psychology, United Kingdom

There is increasing acceptance of the view that many goal-directed cognitive tasks such as problem solving and analogical reasoning are influenced both by conscious, deliberate, analytic processes and by unconscious, automatic, associative processes. The core focus of the present symposium is to confront the challenge of understanding the nuanced ways in which different types of unconscious processing can combine with conscious processing to influence goal-directed cognition. In tackling this challenge the contributors examine a range of evidence for unconscious influences in tasks involving thinking, problem solving, analogising and creativity, as well as ones that pertain to everyday goal-directed behavior. Evidence consistently implicates a consequential role for unconscious activity in such situations, including ineffable processes that underpin representational restructuring, associative priming and spreading activation in semantic networks. In discussing this evidence the symposium contributors view integrative theoretical accounts of the interplay between conscious and unconscious processing as being vital for achieving a comprehensive understanding of goal-directed task performance in all of its various manifestations.

Symposium Abstracts

Unconscious processes and incubation effects in creative problem solving

G. Georgiou[1], K. Gilhooly[1, 2]

[1]University of Hertfordshire, Department of Psychology, United Kingdom
[2]Brunel University, College of Health and Life Sciences, United Kingdom

Setting a problem aside for a period of time enhances solutions when the problem is resumed, and this facilitation is commonly referred to as an 'incubation effect'. Various mechanisms have been put forward to account for this phenomenon, including unconscious processes, conscious processes, and forgetting or set weakening. The research reported here investigates the role of possible mechanisms in incubation effects, and the findings support the view that unconscious processes can best account for the underlying mechanism. The current research also considers how other cognitive processes, such as thought suppression, may also play a role in incubation effects.

Symposium Abstracts

When distraction helps: Facilitating insight through concurrent articulation and irrelevant speech

L. Ball[1], D. Litchfield[2], J. Marsh[2]

[1]University of Central Lancashire, School of Psychology, United Kingdom
[2]Edge Hill University, School of Psychology, United Kingdom

We report an experiment investigating the "special-process" theory of insight problem solving, which claims that insight arises from non-conscious, non-reportable processes that enable the beneficial restructuring of problems. We predicted that reducing opportunities for speech-based processing during insight problem solving should permit special processes to function more effectively and gain conscious awareness, thereby facilitating insight solutions. We distracted speech-based processing by using either articulatory suppression or irrelevant speech, with findings for these conditions supporting the predicted insight facilitation effect relative to silent working or thinking aloud. The latter condition was included to investigate the currently contested effect of "verbal overshadowing" on insight, whereby thinking aloud is claimed to hinder the operation of special, non-reportable processes. Whilst verbal overshadowing was not evident in final solution rates, there was nevertheless support for verbal overshadowing up to and beyond the mid-point of the available problem solving time. Overall our data support a special-process theory of insight, whilst also pointing to the role of moderator variables (e.g., available time for solution) in determining the presence or absence of effects predicted by the special-process account.

Symposium Abstracts

09:40 – 10:00

Costs and benefits of distraction for insight problem solving: The role of problem modality

J. Marsh[1], E. Threadgold[2], L. Ball[2]

[1]University of Central Lancashire, School of Psychology, United Kingdom
[2]City University, London, School of Psychology, United Kingdom

Sequences of auditory events within a to-be-ignored stream of sounds impair tasks involving the short-term serial recall of visual-verbal items: The preattentive and obligatory processing of the order of the changing stimuli conflicts with the deliberate speech-based processing (subvocal rehearsal) of the to-be-remembered stimuli. Thus, presenting a to-be-ignored changing sequence reduces the efficiency of, and opportunity for, speech-based processing. Here we report a dissociation between the impact of to-be-ignored changing sequences on visual-verbal and visuo-spatial insight problem solving. Reducing the opportunities for speechbased processing [via the presentation of changing-state sequences (changing tokens cf. repeated-tokens)] disrupted visual-verbal insight problem solving in the context of the compound remote associate task (CRAT), but facilitated visuo-spatial insight problem solving in the context of the "pigs in a pen" and "triangle" problems. Taken together, these results provide mixed support for the "business-as-usual" and "special-process" theories of insight problem solving. The finding that reducing the opportunity for speech-based processing impaired visual-verbal insight problem solving is consistent with the business-as-usual account, which suggests that both non-insight and insight problems recruit verbally-based processes. However, the facilitation of visuo-spatial problem solving by reducing opportunity for speech-based processing is consistent with the "special-process" theory, which purports that insight arises from non-conscious, ineffable processes that permit problem restructuring. Further uses of distraction as a tool to understand the complex interplay between conscious and unconscious processing in goal-directed problem solving performance are discussed.

Symposium Abstracts

A comparison of true and false memory priming in analogical reasoning

E. Threadgold[1], M. Howe[2], S. Garner[3]

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True and false memories can provide effective primes to both insight problem solutions (Howe, Garner, Ball & Dewhurst, 2010) and verbal analogical reasoning problems (Howe, Threadgold, Garner & Ball, 2013). In terms of the strength of priming, 'self-generated' false memories have been demonstrated to provide more effective primes to analogical problem solutions than 'other-generated' true memories (Howe et al., 2013). This experiment presents a direct comparison of the strength of true and false memories in priming the solution to a novel type of verbal proportional analogy task known as 'homonym analogies' (refer to Howe, Garner, Threadgold & Ball, 2015). The aim of the experiment was to determine if self-generated false memories create stronger primes to analogical reasoning problems, when both a related true and false prime are available prior to solving an analogy. Within a homonym analogy, the c term of the analogy is a homonym term with two or more meanings (for example 'fur is to bear as bark is to tree'). The first two terms of the analogy set a particular context of the homonym term (bark in terms of an animal), yet to solve the analogy correctly, participants must access an alternative interpretation of the homonym term (bark in terms of the outside of a tree). Participants with an average age of 18- and 11-years were primed with two Deese-Roediger-McDermott (DRM) lists prior to solving each analogy. One list primed the correct context answer with either a true or false memory (the critical lure was tree), a further list the incorrect context answer with either a true or false memory (e.g. dog). Participants were provided with four multiple-choice options from which to select their answer. Results are interpreted in terms of spreading activation, semantic search, and analytical mapping, and demonstrate that false memories influence decision-making.

Symposium Abstracts   10:20 – 10:40

The unconscious influence of repressive coping on mental and physical health

J. Erskine[1], G. Georgiou[2], L. Kvavilashvili[1]

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Repressive coping has been conceptualised as an automatic and non-conscious avoidance of negative and personally threatening information both in the external and internal environment. This study presents evidence from 230 participants aged between 18 and 85 suggesting that the prevalence of this form of avoidant coping may be higher in older adults and may increase with age across the lifespan. Furthermore, this study demonstrates that increased repressive coping in older adults is protective of their mental health and wellbeing while not being physically damaging.

Symposium Abstracts

Unconscious influences on goal-directed cognition

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The papers gathered together in this symposium demonstrate the way in which goal-directed cognitive tasks such as problem solving, analogical reasoning and creative thinking can be influenced both by conscious, deliberate, analytic processes and by unconscious, automatic, associative processes. The evidence consistently implicates a consequential role for unconscious activity in such situations, including ineffable processes that underpin representational restructuring, associative priming and spreading activation in semantic networks. In discussing this evidence a central question is whether it is possible to develop an integrative theoretical account of the interplay between conscious and unconscious processing in goal-directed cognition. Some suggestions for achieving such conceptual integration will be outlined.

Symposium

09:00 – 11:00 | Room: Amoroza B - C

Cognitive plasticity: evidence for behavioral and neural changes after intensive cognitive training

T. Strobach[1], J. Karbach[2]

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[2]Goethe-University, Department of Psychology, Germany

Recently, there has been an increasing interest in the effects of cognitive training on the cognitive and neural machinery. Many of the reported training effects are related to basic domains like attention, working memory, executive functions, or intelligence. They were demonstrated in samples differing in age and other cognitive characteristics. The interest in training studies is to a large extent related to empirical reports and observations suggesting that appropriate training interventions can yield broad learning effects and may generalize to other nontrained tasks. Furthermore, these studies aimed at specifying the underlying cognitive and neural mechanisms explaining training-related plasticity. The aim of this symposium is to bring together these different approaches in the field of cognitive training and to integrate their latest findings. As a first example, Meiran et al. will present a study investigating behavioral transfer effects after training on different procedural components of working memory. Using neuropsychological methods, Schubert et al. assessed transfer effects after complex working memory updating training. To summarize the tremendously increasing amount of literature in the field, Karbach et al. present data of meta-analyses of studies in younger and older adults investigating the effectiveness of executive control training. Similarly, Bediou et al. provide a meta-analytic overview of video-game training effects on the domains perception, attention, and cognitive skills. Konen and Schmiedeck analyzed intraindividual performance variability during cognitive training. With a focus on cognitive mechanisms underlying training effects, Strobach and Schubert will provide empirical evidence for the acquisition of executive skills during training of simultaneous dual tasks.

Symposium Abstracts

Training Procedural Working Memory

N. Meiran[1], M. Pereg[2], N. Shahar[3]

[1]Ben-Gurion University of the Negev, Department of Psychology, Israel
[2]Ben Gurion University of the Negev, Psychology, Israel
[3]Ben-Gurion University, Psychology, Israel

Working memory consists of a declarative section (dWM), involved in maintaining facts, and a procedural section (pWM), involved in maintaining task-related information (Oberauer et al., 2013). The current study aimed at improving pWM. We used the training protocol of Shahar and Meiran (2015) which is characterized by heavy pWM demands, using combined elements from the task-switching and the N-Back tasks and adaptive difficulty level. Participants either underwent 12 (or 16) sessions involving this task, an active control task involving visual scanning, or no training. The primary outcome measures included (1) dWM capacity (Operation Span and Symmetry Span); (2) the rate of exceptionally slow responses (the Tau parameter from the ex-Gaussian RT distribution) in a 6-choice RT task with arbitrary mapping, indexing the rate of retrieval from pWM (Shahar et al., 2014); and two indices taken from the NEXT paradigm (Meiran et al., 2015), (3) performance immediately following instructions; and (4) the reflexive activation of instructions, both tapping the fidelity of pWM representations. Analyses were still underway when the abstract was submitted.

Symposium Abstracts

09:20 – 09:40

On neural changes and behavioral transfer effects after dual-n-back training: An fMRI study

T. Schubert[1], T. Salminen[1], T. Strobach[2], S. Kuehn[3]

[1]Humboldt-University Berlin, Psychology, Germany
[2]Medical School Hamburg, Department of Psychology, Germany
[3]Max-Planck Institute for Human Development, Psychology, Germany

Recent studies showed that extensive working memory trainings may lead to training-related changes that may transfer to new untrained task contexts. However, the range of the transfer effects as well as the mechanisms remain open. While some accounts assume a general training-related boosting of the executive system and of its related neural substrate, other accounts suggest that transfer after working memory training relies on the improvement of task-specific updating routines, which are commonly used in the training and transfer situation. We tested this for the case of dual-n-back training (Jaeggi et al., 2008; PNAS). Training groups were: dual-nback, single-n-back (active) and no-contact. Transfer was tested for dual- and single-updating tasks and the related neural changes measured with fMRI. The hypothesis of a general cognitive boosting predicts that transfer occurs between those task conditions, which show most neural overlap of the general frontal-parietal networks; the hypothesis of training and transfer of task-specific routines predicts that transfer occurs due to the improvement of working-memory updating routines in the striatum, a candidate region for working memory updating (Dahlin et al., 2008, Science). As a result we found transfer between the dual-n-back and dualupdating tasks only for the dual-n-back training group; this group showed a strong activation increase in the striatum from pre- to post-test AND a reduced neural overlap between the fronto-parietal activations in the dual-n-back and dual-updating tasks after training. By contrast, we found NO transfer between dual-n-back and updating tasks AND a maximal overlap after training between the fronto-parietal networks in these tasks for the single-n-back and the no-contact groups. Together, this suggests that training-related improvements of task-specific updating routines and the related neural changes in the striatum but not a general boosting of the central executive system are responsible for transfer effects resulting from dual-n-back training.

Symposium Abstracts

How effective is executive control training? Meta-analytic findings from younger and older adults

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[1]Goethe-University Frankfurt, Psychology, Germany
[2]Georgia Institute of Technology, School of Psychology, United States

The effects of cognitive training have been widely discussed in the scientific community over the last years. Most researchers agree that intensive training on a given task can lead to substantial performance increases, but it is highly debated whether these training-related benefits transfer to new, untrained tasks. To date, we know that the type of training, its intensity, and the age of participants can play an important role regarding the magnitude of transfer effects. Specifically process-based cognitive training (i.e., training focusing on basic processing capacities, such as working memory or cognitive flexibility) seems to be beneficial across a wide range of ages. Still, systematic meta-analyses focusing on the benefits of process-based training in different age groups are scarce. We therefore conducted a series of such meta-analyses investigating whether processbased executive control training results in significant improvements on the training tasks and whether these training-induced improvements generalized to near and far transfer tasks in younger adults (17-35 years) and older adults (>60 years). For young adults, fifty-one intervention studies published between 1960 and 2015 were included in the analyses. The results indicated that the groups trained on working memory or executive functions significantly improved their performance on trained tasks and showed near transfer effects compared to passive and active control groups. Far transfer effects were only seen on working memory tasks when the trained group was compared to a passive control group. For older adults, forty-nine intervention studies published between 1983 and 2013 were included in the analysis. We found that working memory and executive control training resulted in significantly larger improvements on the training tasks and also in larger near and far transfer effects than both active and passive control conditions.

Symposium Abstracts

Meta-analysis of the Impact of Playing Action Video Games on Cognition

B. Bediou[1], D.M. Adams[2], R.R. Mayer[3], C.S. Green[4], D. Bavelier[5], [6]

[1]Universite de Geneve, FAPSE, Psychologie, Brain and Learning Lab, Switzerland
[2]University of Notre Dame, Department of Psychology, United States
[3]University of California, Santa Barbara, Department of Psychological and Brain Sciences, United States
[4]University of Wisconsin-Madison, Department of Psychology, United States
[5]University of Geneva, FPSE, department of psychology, Switzerland
[6]University of Rochester, Department of Brain and Cognitive Sciences, United States

The ubiquity of video game play has recently raised interest in its possible use beyond entertainment, in particular in education or in health applications. Yet, any such practical application requires thorough quantitative evaluation of rigorous scientific research on their effects on cognition. Because the impact of video game play may vary with the type of video games used, we conducted a metaanalysis investigating the impact one specific subtype of video games that has received growing interest from the scientific community: commercially available action video games (AVG). We addressed several of the most timely and critical questions related to the effects of action video games, such as: (i) Is AVG play associated with enhancements in cognition? (ii) Which aspects of cognition are affected, and which ones are not? Are the effects of similar magnitudes across various cognitive domains? (iii) Can improvements in cognition be causally attributed to AVG, for example in training studies? (iv) How do methodological choices, such as recruitment method, or participants' age, impact the magnitude of these effects? Our review of the literature identified more than 200 effect sizes (Hedge's g), corresponding to more than 130 different experiments. We find that AVG play improves cognition moderately, by about half of a standard deviation. Significant effects were found in several sub-domains of cognition, such as perception, top-down attention, and multi-tasking, whereas other domains, such as verbal cognition, were not significantly altered by AVG play. Significant effects were found not only in cross-sectional studies, but also in intervention experiments confirming a causal role for AVG in improving cognition. Our results confirm that AVGs have the potential to become powerful tools for enhancing cognition.

Symposium Abstracts

Intraindividual variability in cognitive training data

T. Könen[1], [2], F. Schmiedek[3], [4]

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[3]German Institute for International Educational Research (DIPF), Frankfurt, Germany
[4]Max Planck Institute for Human Development, Center for Lifespan Psychology, Berlin, Germany

In the COGITO Study, 101 younger and 103 older adults practiced twelve tests of working memory (WM), perceptual speed, and episodic memory for over 100 daily 1-h sessions. Both age groups showed reliable positive near transfer effects to WM ability compared to a control group but only the younger age group showed far transfer effects (Schmiedek et al., 2010). The present work aims at investigating intraindividual variability and gains in the trained WM tasks (mean of one figural, numerical, and verbal task, respectively). Preliminary multilevel analyses reveal that, in both age groups, about 40% of the within-person variance in WM performance were explained by a positive linear trend over time (Pseudo-R2 younger = 36%, Pseudo-R2 older = 43%). This trend reliably varied between individuals in both groups, implying that the amount of training progress varied between individuals. To explain such individual differences, it might be valuable to consider internal and external factors contributing to performance during the training. Besides other variables, we considered the sleep behavior during the study as a potential factor because there is ample evidence for the importance of sleep for cognitive performance. All participants briefly reported their last night's sleep quality and duration in every training session. Our hypotheses were that those individuals who on average slept more and better in the training phase gained more in WM performance over time. In older adults, average sleep quality, but not duration, was positively related to the strength (random effect) of training progress in WM performance, implying that older adults with higher sleep quality benefited more over time (Pseudo-R2 = 9%). There were no reliable relations in younger adults. This demonstrates that taking contextual factors into account might help to understand why some individuals benefit more from the same cognitive training than others.

Symposium Abstracts

Improved dual-task performance after practice due to efficient task Instantiation

T. Strobach[1], T. Schubert[2]

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[2]Humboldt University Berlin, Department of Psychology, Germany

Practice of two simultaneous dual tasks results in an improvement of dual-task performance. The present study investigates the underlying cognitive mechanisms responsible for this improvement: The efficient instantiation of information of two component tasks in working memory at the beginning of each dual-task trial. In situations that do not overload the limited capacity of working memory, this instantiation is the consequence of dual-task practice, but it is not the consequence of separate practice of two tasks in single tasks. Under conditions of rather simple component tasks with no assumed working memory overload, we found advantageous dual-task performance after dual-task in contrast to single-task practice. These results are consistent with the assumption that improved dual-task performance after dual-task practice is the consequence of an efficient instantiation of information of two component tasks in working memory. Further studies tested the range and limits of this conclusion with component task combinations that may overload the working memory capacity; these tests thus combined rather difficult or complex component tasks.

Symposium

09:00 – 11:00 | Room: Amoroza D

Circadian influences on human cognition: a multidisciplinary approach from cognitive neuroscience and chronobiology

A. Correa[1], F. Padilla[2]

[1]Universidad de Granada, Experimental Psychology, Spain
[2]Universidad de Granada, Psicologia Experimental, Spain

Biological organisms have developed timing mechanisms to orchestrate temporal coordination of their physiology and behaviour with their environment. The circadian system controls this timing function during the 24-h day, resulting in fluctuations of neural processes and behavioural performance. The scientific understanding of how circadian factors (e.g., time of day, chronotype, light exposure) can influence neurocognitive processes is important: 1) to prevent current diseases related to disruption of circadian rhythms, 2) to improve sleep health, and 3) to promote safety and efficiency during the performance of tasks in which human error can lead to negative consequences.   The symposium aims to advance our current knowledge on the relationship between circadian and neurobehavioural processes by bringing together the work by European researchers coming from prestigious laboratories of four different countries, who also come from multiple fields. This symposium is expected both to provide attendants with a rich "combo" of state-of-the-art methodologies and findings, and to promote crosstalk between Cognitive Neuroscience and Chronobiology disciplines.

Symposium

09:00 – 11:00 | Room: Amoroza D

Symposium Abstracts

09:00 – 09:20

Inter-individual differences in sleep-wake regulation: impact on attentionrelated cerebral correlates

C. Schmidt[1], M. Maire[2], C. Reichert[3], P. Peigneux[4], F. Collette[5], C. Cajochen[1]

[1]University of Liege, Cyclotron Research Center, Belgium
[2]Psychiatric Hospital of the University of Basel, Center for Chronobiology, Switzerland
[3]University Basel, Centre for Chronobiology, Switzerland
[4]Neuropsychology and Functional Neuroimaging Research Unit (UR2NF), Universite Libre de Bruxelles, Belgium
[5]University of Liege, Cyclotron Research Centre, Belgium

The interaction between the circadian timing system and homeostatic sleep pressure affects our sleep-wake cycle but also modulates cognition. Some people perform best in the morning whereas others are more alert in the evening. These chronotypes provide a unique way to study the effects of sleep-wake regulation on the cerebral mechanisms supporting cognition. Using functional magnetic resonance imaging, we found that maintaining attention in the evening was associated with higher activity in evening than morning chronotypes in a region of the locus coeruleus and in an anterior hypothalamic region putatively encompassing the circadian master clock. Activity in the latter concomitantly decreased with increasing homeostatic sleep pressure as measured by sleep slow-wave-activity in the preceding night. The results speak in favor of the influence of basic sleep-wake regulation mechanisms on the neural activity underpinning human behavior. In another study, we investigated the impact of differential sleep pressure levels and of a polymorphism in the clock gene PERIOD3 (PER3), shown to act on sleep homeostasis. We studied cerebral correlates underlying vigilant attention during the late night, when circadian sleep promotion is maximal, under high and low sleep pressure conditions (40h sleep deprivation versus multiple naps). The PER3 polymorphism modulated BOLD activity such that activation in attention-related fronto-parietal brain regions increased in the previously reported more resilient PER34/4 carriers under high compared to low sleep pressure, but mostly decreased in PER35/5 carriers. Further, time-on-task-dependent thalamic activity increases were present only in PER34/4 carriers under sleep loss. The data finally suggest that the PER35/5 carriers show a stronger shift into a task-inactive default-mode network in between task-relevant stimulus occurrence. This talk provides a multifaceted view on the brain mechanisms involved in the maintenance of wakefulness and associated cognitive processes over the 24-hour cycle and its modulation by inter-individual differences in sleep-wake regulation.

Symposium Abstracts

Sleep-wake and time of day dependent modulations of working memory

C. Reichert[1], M. Maire[1], C. Cajochen[1], C. Schmidt[2], [2]

[1]University Basel, Centre for Chronobiology, Switzerland
[2]University of Liege, Cyclotron Research Center, Belgium

Sleep-loss-related deteriorations in cognitive performance are pronounced during night- and counteracted during daytime due to circadian mechanisms. Furthermore, a genetic polymorphism in adenosine deaminase (ADA; rs73598374) elicits variance in susceptibility to sleep-loss: G/A-allele carriers are more affected by sleep deprivation (SD) compared to G/G-allele carriers. Cerebral correlates of circadian and genetic variations in performance during sleep-loss are largely unknown. In a within-subjects design, 31 healthy adults (thereof 12 G/A-allele carriers) participated in a 40-h sleep deprivation (SD) and a 40-h nap protocol (NP, 10 cycles of 80-min naps / 160-min wakefulness). Working memory (WM) performance was assessed by the n-back task every 4 h, every other time in a magnetic resonance scanner. Under SD, performance deteriorations were most prominent during nighttime, but recovered during the course of the next day ($p<0.05$). Blood-oxygen-level dependent (BOLD) activity decreased under SD from day- to nighttime in frontal regions ($pFWE<0.05$), while a further extension of wakefulness into the second day was not associated to further activity declines. Superior frontal BOLD activity was positively associated to performance during SD at night and day ($pall<0.05$), and functionally connected to hypothalamic and brainstem regions at daytime after sleep-loss ($ps.v.c.<0.05$). Hypothalamic activity covaried with a marker of circadian wake-promotion (evening nap sleep efficiency; $ps.v.c.<0.05$), and predicted the ability to perform well under sleep-loss during daytime. G/A-allele carriers performed worse during SD compared to NP, while G/G-allele carriers' performance did not differ between conditions ($p<0.05$). BOLD activity declines from day to nighttime under SD were more pronounced in G/Acompared to G/G-allele carriers. Overall, the data indicate that sleep-loss related activity decreases underlying WM are induced by a passage from day- to nighttime, while circadian wake-promotion during daytime counteracts further activity declines. Furthermore, the results suggest that adenosinergic mechanisms are involved in the regulation of WM decrements during sleep-loss.

Symposium Abstracts

Human chronobiology: Circadian photoreception, the clock and alertness

T. Woelders[1]

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Many bodily functions in humans are regulated by two rhythmic processes: the circadian pacemaker (SCN), and 24-hour patterns in behaviour such as the sleep/wake cycle. The forced desynchrony protocol has been used to disentangle these processes and to reveal their relative contributions to cognition, mood and physiological functions. When the two rhythmic processes are misaligned, such as in nightshift workers, problems occur such as retaining an optimal level of alertness and performance. This night time decrease in alertness and performance can be partially countered by light exposure. Blue light seems to be the most effective, which suggests a significant role for the blue-sensitive intrinsically photosenstitive retinal ganglion cells (ipRGCs), with little or no contribution of the cones. Given that cones do indirectly signal to brain areas involved in the non-image-forming (NIF) effects of light, our most recent work focuses on the relative contributions of cones to NIF effects. One reason why cones do not appear to contribute to NIF effects during prolonged light exposure, may be that light adaptation occurs on a much smaller time-scale in cones than in ipRGCs which results in a fast decay of cone contribution over time. We developed a lighting protocol that was expected to counter this adaptation in cones to maximize their contribution to alertness during the night. There were, however, no differences found between the experimental conditions and control. This may suggest that cones do not contribute to alertness as much as ipRGCs do, or that the chosen protocol did not excite the cones as much as expected.

Symposium Abstracts

10:00 – 10:20

Effects of light upon vigilance and simulated driving tasks

B. Rodriguez Morilla[1], J.A. Madrid Pérez[2], E. Molina Martin[2], A. Correa[3]

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[2]University of Murcia, Cronolab, Physiology Department, Spain [3]Universidad de Granada, Experimental Psychology, Spain

Vigilance maintenance along time on prolonged tasks usually deteriorates under adverse conditions such as high levels of sleepiness. According to research findings, exposure to blue-enriched bright light leads to alerting effects on the nervous system and thus to better performance on simple vigilance tasks such as the Psychomotor Vigilance Task, while the results of studies addressing the effects of red spectrum light are not concluding. Our study tested the effectivity of a blue-enriched polychromatic white light and an orange light compared to a control condition of dim light over the performance on a simulated driving task (90 minutes long) and the Psychomotor Vigilance Task (10 minutes long). Our preliminary results showed the proximal-distal temperature gradient (DPG) to rise along the driving task in the control condition, in line with the expected vigilance decrement. To the contrary, we found a DPG decrement along the driving task in the blue-enriched white light condition , which is consistent with an alerting effect. However, we also observed a decrement of accuracy along the driving task in the blue-light light condition. Finally, according to post hoc analyses the control group showed the greater vigilance decrement along time on task in the Psychomotor Vigilance Task. Exposure to orange light led to intermediate results between those of blue-enriched and control conditions in all the measurements. These data suggest that the activation induced by blue-enriched light does not necessarily imply improvement in every cognitive process: while it may support vigilance maintenance in low-demanding tasks such as the PVT, excessively high levels of activation might rather deteriorate accuracy in high demanding task requiring precision.

Symposium Abstracts

Neurobehavioural markers of fluctuations in vigilance and executive control associated with circadian factors

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[2]Universidad de Granada, Centro de Investigacion Mente, Cerebro y Comportamiento, Spain

Human performance in tasks demanding vigilance and executive control depends on the time of day at which these tasks are performed. Furthermore, a specific time of day can be optimal or suboptimal according to individual differences in chronotype (morning-, intermediate and evening-type persons). This talk will present evidence from our laboratory showing that vigilance and inhibitory control during the Sustained Attention to Response Task (SART) is higher at optimal vs. suboptimal times of day (e.g., morning rather than evening sessions in morning-type people). We will also present research testing the effects of blue and amber lights on the ability for response inhibition during the SART. Finally we will discuss the utility of different markers (behavioural performance, electroencephalography, body temperature) to predict fluctuations in vigilance and inhibitory control associated with circadian effects.

Oral Presentation

11:30 – 11:50 | Akamas A

Attention orienting in assimilation and accommodation modes

C. Hellweg[1], W. Greve[2], C. Bermeitinger[2]

[1]Universitat Hildesheim, General Psychology, Germany
[2]Universitat Hildesheim, Developmental Psychology, Germany

The Dual Process Model of goal pursuit and goal adjustment (Brandtstadter & Rothermund, 2002) distinguishes between assimilation and accommodation processes, which are both means to reduce discrepancies between the desired and the actual state, when personal goals are blocked. Accommodation involves letting go of one's goals. Here attention is assumed to be broader than in the assimilation process, which involves holding on to the blocked goal. The aim of the present study was to determine if there are differences in attentional orienting between assimilation and accommodation processes. Participants worked through tasks from the German version of the Compound Remote Associate (CRA) Test while simultaneously performing a spatial cueing task. In order to experimentally create a blocked goal, similar tasks to those of the CRA Test were added, which were not solvable. The results revealed that attentional disengagement was faster in the accommodation than in the assimilation mode. Results will be discussed against the background of theories regarding goal dissolving theories as well as of attention theories.

Oral Presentation

Reward Shapes Attention

J. Theeuwes[1]

[1]VU University Amsterdam, Cognitive psychology, Netherlands

Classic models of attentional control assert a dichotomy between top-down and bottom-up control, with the former determined by current selection goals and the latter determined by physical salience. In the present presentation, I will argue that this theoretical dichotomy is inadequate to explain a number of cases in which neither current goals nor physical salience can account for strong selection biases. In this talk I will discuss recent evidence that suggests that visual selection is determined by previous experience of rewards and punishment. We show attentional and oculomotor capture by stimuli that are associated with monetary reward. Moreover, stimuli associated with punishment (i.e., predicting electric shocks) also capture attention and eye movements indicating that not only reward but also threatening stimuli are prioritized by the visual system. Finally, we show that stimuli that merely signal the presence of reward (c.f., Pavlovian conditioning) have to ability to summon attention. The present study adds to the growing evidence that stimuli associated or signalling reward and punishment have the ability to exogenously capture spatial and non-spatial attention independent of task-set, goals and salience.

Oral Presentation

12:10 – 12:30 | Akamas A

Numerical blink – Distance matters

S. Naparstek[1], M. Salti[2], Y. Kessler[2], A. Henik[2]

[1]Ben-Gurion University of the Negev, Psychology, Israel
[2]Ben-Gurion University of the Negev, BGU Brain Imaging Researach Center, Israel

In the attentional blink (AB) paradigm, participants are presented with a stream of stimuli in a rapid serial visual presentation (RSVP) and are asked to report two targets. Typically, when the second target appears 2-4 lags after the first target, accuracy rates for reporting T2 are impaired. A common explanation is that the two targets compete for the same attentional resources. To examine whether AB can be modulated by target meaning, the numerical distance between two number targets was manipulated. Participants were presented with 18 letter distractors and 2 digit targets and were asked to report the targets according to the order of presentation. Three variables were manipulated: the number of lags between the targets (1-6 lags), the numerical distance (D) between the targets (D1: e.g., 1-2; D2: e.g., 1-3; D5: e.g., 1-6) and the order in which the targets were presented (ascending: e.g., 3 then 4; descending: e.g., 4 then 3). The results revealed that numerical distance modulated AB. Namely, accuracy rates for reporting the second target were higher for small distances (distance 1 & 2) than for the large distance (distance 5). Furthermore, it seems that the order of targets also modulated AB. That is, participants were more accurate in responding to ascending than to descending presentations. These results imply that AB is not purely attentional and that semantic processing occurs in a pattern indicative of the existence of the classical mental number line.

Oral Presentation

12:30 – 12:50 | Akamas A

Stimulus-driven attentional capture without awareness

T. Schoeberl[1], U. Ansorge[1]

[1]University of Vienna, Faculty of Psychology, Austria

The past two decades of attention research spawned intense debates about how exactly objects are selected by visual attention. One view is that at early processing stages after stimulus onset attentional selection is completely stimulus-driven, automatic, and independent of the top-down search settings. Complementary to this view is the contingent capture hypothesis. It holds that even at early stages attentional selection is contingent on top-down control settings. Although the theoretical debate is unresolved up until today, recent evidence suggests that awareness of the impinging stimuli is critical. On this view, at least the capture of attention by subliminal onsets is truly stimulus driven and automatic. We tested this idea with a Posner cueing task: The cue was presented as one out of three black (or white) rings with a barely noticeable lead time of 16 ms so that the three rings appeared to have simultaneous onsets (i.e., the singleton-onset of the cue was subliminal). We report data from a series of experiments clearly supporting the view that attentional capture by subliminal stimuli is stimulus-driven: The subliminal cues captured attention even when the cue was completely task irrelevant and did not share any task relevant features with the searched-for targets. We also discuss preliminary data of a second series of experiments in which we tested if attention capture by subliminal onsets could be attributed to a match between the cue's features and the features that designate the appearance of the entire target screen (display-wide contingent capture).

Oral Presentation

The structure of distractor-response bindings - or what is a feature in feature-binding?

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Human action control is influenced by stimulus-response bindings: Responses to a target are bound even with accompanying distractor stimuli, and subsequently encountering the distractors retrieves the associated response. Here we analyze the specific structure of distractor-response bindings. We test the predictions of a configural approach, assuming integration of the entire distractor-object with a response against an elemental approach that predicts integration of individual distractor features with the response. Four experiments indicate that both, configural and elemental bindings exist and show the boundary conditions for each type of binding. These findings provide detailed insights into the architecture of bindings between irrelevant stimuli and actions and thus allow for specifying how distractor stimuli influence human behavior. Relevant factors for the definition of 'features' are discussed.

Oral Presentation

11:30 – 11:50 | Akamas B

Relative vs. absolute size: the automatic processing of non-symbolic fractions

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When encountered with fractions in standard curricula, children exhibit major difficulties and these difficulties persist through adulthood and affect our understanding of everyday information. Most of the studies so far focused on symbolic representation of fractions (in common form: ., ., or in decimal form: 0.5, 0.25). The current study examines the processing of non-symbolic fractions and asks if the hurdle origins in an earlier stage of processing relative size. We investigated the processing of non-symbolic fractions in the form of partof- the-whole. The size of a part (like a quarter of a glass of water) can be processed relatively to the whole or, independently, as an absolute size. Thus, to assess the natural processing of non-symbolic fractions, we used a conflict task (Stroop-like) to contrast the two size types. We found that both size types were automatically processed. When comparing parts to wholes, parts were automatically processed as smaller than wholes, regardless of their absolute size. We conclude that the difficulties children encounter when introduced with fractions are not due to a lack of their ability to understand relative size. Additionally, the results of the current study, together with previous findings suggest that ratios are better understood when they are presented as continuous sizes.

Oral Presentation

The Role of Coding Strategies on the Modulation of Spatial-Numerical Associations by Working Memory Load

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If participants are instructed to memorize a random sequence of numbers, the spatial-numerical associations (SNA) in a number classification task depend on the ordinal position of the numbers in the memorized sequence (van Dijk & Fias, 2011; Lindemann, Abolafia, Pratt & Bekkering, 2008). The current study investigates the underlying mechanisms of the impact of working memory representations on SNAs by manipulating the spatial characteristics and coding requirements of the memory task. Our experiments demonstrate that the ordinality information itself is not directly associated with spatial codes and can therefor not account for the effects on SNAs. Instead, the results suggest that the modulation of SNAs is driven by the participants' strategy to represent the sequences spatially and the tendency to transform ordinality information into spatial arrangements in visual working memory.

Oral Presentation

12:10 – 12:30 | Akamas B

Uncovering numerical ordinal processing

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Humans use numbers on a daily basis and in different concepts, one of them is ordinality (e.g., the second, third etc.). Ordinality is defined as a main numerical concept and a hallmark feature of numbers but, receives little attention in the field of numerical cognition. We report two studies that are aimed to evaluate the cognitive basis of numerical ordinal processing. Additionally, we investigate the cognitive relationships between the ordinal processing and the approximate numerical system (ANS): Using Continuous Flash Suppression (i.e., a psychophysical method for studying visual perception that allows subliminal presentations via binocular rivalry display), the first study examined the effect of ordinal vs. non-ordinal numerical sequences (masked primes) on numerical estimation (target) in adults. In this experiment, prime stimuli were composed out of three quantities (i.e., group of dots) that were presented in an ordinal (e.g., 3,6,9) or random fashion (e.g., 9,3,6) fallowed by a single quantity (target stimuli). Participants were asked to estimate (via vocal response) the quantity that was presented as target. In the second study, two groups of children (6-7y.o and 10-11 y.o) and a group of adult university students completed an ordinal judging tasks with quantities (i.e., dot patterns) as stimuli. Low visual features of the stimuli (area and density of the dots) were manipulated into two conditions: congruent or incongruent to the quantity presented (e.g. area of the dots increase while quantity decrease- 'a stroop like task'). It was found that (1) numerical estimations were faster when they were preceded by implicit priming of ordered sequences than after priming non ordered sequences. (2) In all three groups, a congruity effect; visual properties affect the ordinal judging of quantity. Hence, ordinality is inattentively processed and affects the very basic cognitive abilities such as estimations of quantities.

Oral Presentation

Mental addition involves shifting attention rightward on a spatial continuum: Evidence from a patient with right unilateral neglect

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Recent findings suggest that mental arithmetic involves shifting attention on a mental continuum where numbers are aligned from left to right, from small to large numbers, with addition and subtraction causing rightward or leftward shifts respectively. Neuropsychological data showing that patients with left neglect experience difficulties for solving subtraction but not addition problems support this hypothesis. However, the reverse dissociation is needed to establish the causal role of spatial attention in mental arithmetic. JPB, a 65- year-old left brain-lesioned patient, exhibiting right unilateral visuo-spatial and representational neglect, was tested with various numerical tasks including, symbolic comparison and arithmetic problem solving. JPB had to compare Arabic digits presented visually to a reference (i.e., "4", "5" or "6" as function of the condition) and was asked to say aloud the answer of auditory presented addition and subtraction problems that were matched for the magnitude of the answer and second operand. JPB performed flawlessly in counting, parity judgement, and writing Arabic numerals under dictation. In numerical comparison, he showed a selective response time increase when judging numbers larger than the references while his performance was normal for smaller numbers. In the arithmetic task, JPB was impaired in solving addition but not subtraction problems. These results converge with previous data to establish a double dissociation between subtraction and addition in patients with left vs. right neglect, and support the idea that mental arithmetic involves mechanisms akin to those of attention orientation. In line with the performance of JPB in comparison tasks, we suggest that attention shifts are involved whenever a number is represented relative to another on a mental continuum.

Oral Presentation

12:50 – 13:10 | Akamas B

Benchmark-based strategies in number line estimation

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Participants' estimation patterns on a number line estimation (NLE) task are often interpreted as the reflection of their underlying mental magnitude representation. Recently, however, several sources of evidence challenge this widespread assumption by suggesting that strategies might play an important role when solving this task. The present study aimed at providing direct evidence for the use of NLE strategies by gathering trial-by-trial verbal strategy reports of 63 adults when solving a 0-1000 NLE task. Participants were assigned to one of three conditions in which the number of benchmarks on the number line was varied to elicit potential benchmark-based estimation strategies: (a) a control condition in which only the origin and endpoint were indicated, (b) a midpoint condition with an extra benchmark at the midpoint (500) and (c) a quartile condition with a benchmark at every quartile (250, 500, and 750). The most common strategies that were observed were strategies in which participants relied on one of the available benchmarks on the number line (87% of the trials). A closer analysis of this class of strategies indicated that participants made use of these benchmarks that were most beneficial to them for estimating numbers in a specific range. Interestingly, we observed that in all three conditions, participants not only made use of the available benchmarks, but also used them to create more refined internal benchmarks (e.g., participants in the quartile condition generated internal benchmarks at the octiles to further refine their NLEs). Contouranalyses of estimation accuracy revealed more accurate estimates at the quartiles in the quartile condition compared to the bounded an midpoint condition and more accurate estimates at the midpoint in the quartile and midpoint condition than in the control condition. The theoretical and educational implications of these findings will be discussed.

Oral Presentation

The effects of age, multilngualism, and education on L1 vocabulary size: Results of a massive online experiment

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We use the results of a large online experiment on word knowledge in Dutch to investigate variables influencing vocabulary size in a large population and to examine the effect of word prevalence—the percentage of a population knowing a word—as a measure of word occurrence. Nearly 300,000 participants were presented with about 70 word stimuli (selected from a list of 53,000 words) in an adapted lexical decision task. We identify age, education, and multilingualism as the most important factors influencing vocabulary size. The results suggest that the accumulation of vocabulary throughout life and in multiple languages mirrors the logarithmic growth of number of types with number of tokens observed in text corpora (Herdan's law). Moreover, the vocabulary that multilinguals acquire in related languages seems to increase their first language (L1) vocabulary size and outweighs the loss caused by decreased exposure to L1. In addition, we show that corpus word frequency and prevalence are complementary measures of word occurrence covering a broad range of language experiences. Prevalence is shown to be the strongest independent predictor of word processing times in the Dutch Lexicon Project, making it an important variable for psycholinguistic research.

Oral Presentation   11:50 – 12:10 | Akamas C

Electrophysiological correlates of novel metaphor processing in a semantic decision and a reading task: N400 and LPC

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While an increased N400 for novel metaphoric utterances has been frequently reported, inconsistent results have been observed for the late positive complex (LPC). Arzouan et al. (2007) showed a reduced LPC, whereas De Grauwe et al. (2010) an increased LPC to metaphoric utterances. In the current study, we further explored the LPC in two experiments with the same set of novel metaphoric, literal and anomalous sentences. In Experiment 1, participants performed a semantic decision task, and in Experiment 2 they read the sentences. As predicted, the N400 effect did not depend on the task, and increased negativity was observed in response to novel metaphoric and anomalous as compared to literal sentences in both experiments. The analysis of the LPC revealed the main effect of sentence type only when semantic judgment was involved (Experiment 1). In line with Arzouan et al. (2007) and contrary to the findings reported by De Grauwe et al. (2010), a reduced LPC amplitude for novel metaphors as compared to literal and anomalous sentences was observed over the posterior sites. We interpret this finding as reflecting secondary semantic integration processes (Friederici et al. 1999). Most interestingly, increased frontal positivity was observed for novel metaphoric as compared to literal and anomalous utterances. In line with Davenport et al. (2011), who investigated predictability effects in literal language comprehension, we interpret this increased frontal positivity as reflecting the revision of the model of the sentence meaning needed due to violated expectations. However, in contrast to their results, in our experiment this positivity seems to be response-related, since response-locked analyses revealed the main effect of utterance type over frontal, but not parietal sites.

Oral Presentation

Neighing, barking, and drumming horses - object related sounds help and hinder picture naming

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A currently controversially debated question in speech production research is whether lexical selection ought to be viewed as a competitive or a non-competitive process. Previous evidence often cited in support of the competitive view stems from the picture-word interference task. In this task participants name pictures while ignoring distractor words. One major finding is the semantic interference effect; naming latencies are longer with semantically related picture-word pairs (e.g., horse – dog) compared to unrelated picture-word pairs (e.g., horse – drum). However, recently it has been argued that this semantic interference effect might reflect postlexical processes induced by the use of distractor words and not competitive lexical selection as previously assumed. We addressed this issue by using distractor sounds instead. Participants named pictures (e.g., of a horse) in the presence of different kinds of naturalistic sounds (e.g., neighing, barking, or drumming). We observed facilitation from congruent sounds (e.g., picture: horse, sound: neighing vs. drumming) and interference from semantically related sounds (picture: horse, sound: barking vs. drumming). These results mirror those observed with distractor words in similar conditions and suggest that theories of speech production need to include a competitive selection mechanism at the lexical processing stage, or the prelexical processing stage, or both.

Oral Presentation

Is lexical integration really a matter of time? A Hebb learning approach

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The Hebb repetition paradigm is a serial-order learning task in which participants recall sequences of items (e.g., syllables) with one particular sequence repeated on every nth trial. In 2012, Szmalec and colleagues used the Hebb paradigm as an analogue of novel word-form learning to investigate whether the creation of novel lexical entries requires sleep. Overall, they found that sleep is not crucially involved in lexical consolidation and that the mere passage of time suffices to observe lexical engagement. These findings support the two-stage account of lexical learning, which proposes that novel word-forms are temporarily stored in the hippocampus after which they are gradually transmitted to neocortical structures responsible for the long-term storage of these novel lexical representations. In the current study, we challenge the idea of necessary involvement of time in lexical consolidation, using the same Hebb paradigm. We explored two factors that could possibly contribute to this, namely the strength and the explicitness of the memory traces. We manipulated the strength of the memory trace using criterion learning and the explicitness by announcing half of the Hebb repetitions to the participants. Overall, we observed immediate lexicalization only for the syllable sequences that were learned explicitly and to a criterion of perfect recall. Results are discussed in the light of previous inconsistent findings related to the two-stage account of lexical consolidation.

Oral Presentation

The effect of learning to read on the neural systems for vision and language: A longitudinal approach with illiterate participants

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How do human cultural inventions such as reading result in neural re-organization? In this first longitudinal study with young completely illiterate adult participants, we measured brain responses to speech, text, and other categories of visual stimuli with fMRI before and after a group of illiterate participants in India completed a literacy training program in which they learned to read and write Devanagari script. A literate and an illiterate no-training control group were matched to the training group in terms of socioeconomic background and were recruited from the same societal community in two villages of a rural area near Lucknow, India. This design permitted investigating effects of literacy cross-sectionally across groups before training (N=86) as well as longitudinally (training group N=25). The two analysis approaches yielded converging results: Literacy was associated with enhanced, left-lateralized responses to written text along the ventral stream (including lingual gyrus, fusiform gyrus, and parahippocampal gyrus), dorsal stream (intraparietal sulcus), and (pre-) motor systems (pre-central sulcus, supplementary motor area) and thalamus (pulvinar). Significantly reduced responses were observed bilaterally in the superior parietal lobe (precuneus) and in the right angular gyrus. These effects corroborate and extend previous findings from cross-sectional studies. However, effects of literacy were specific to written text and (to a lesser extent) to false fonts. Contrary to previous research, we found no direct evidence of literacy affecting the processing of other types of visual stimuli such as faces, tools, houses, and checkerboards (cf. Dehaene et al., 2010, Science). Furthermore, unlike in some previous studies, we did not find any evidence for effects of literacy on responses in the auditory cortex in our Hindi-speaking participants. The latter result in particular raises questions about the extent to which phonological representations in the auditory cortex are altered by literacy acquisition or recruited online during reading.

Oral Presentation

Conflict management: Reactive withdrawal from conflict

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Conflict is ubiquitous and comes in many different ways. Not surprisingly, the means to control conflict are diverse, too. To account for these different ways to master a conflict, the present project takes an initial step towards a characterization of the variability of control. To this aim, two dimensions of control will be identified that result from partially incompatible constraints on action control. These dimensions depict a trade-off between flexibility and stability and between anticipatory early selection and reactive late correction of control parameters. To describe how these control trade-offs interact and to explain how conflict is handled to ensure adaptation behavior, a taxonomy for conflict management is proposed. When expecting a conflict situation to occur in the future, one can recruit more effort to resolve the conflict, for instance by proactively inhibiting unwanted urges or habits. Alternatively one can avoid the future conflict situation and thereby circumvent possible failures to control habits and impulses. Furthermore, when currently facing a conflict, reactive control mechanisms allow people to mobilize more effort to overcome the conflict. A corollary of this framework suggests that one strategy to control conflict comprises of a tendency to withdraw from a conflict situation to minimize the risk of indulging in their impulses and habits. The present research used a voluntary task switching paradigm to test whether participants reactively withdraw from conflict situations. In Experiment 1, participants chose on each trial between two univalent tasks. Switch rates increased following conflict trials, indicating avoidance of conflict. Experiment 2 employed bivalent instead of univalent stimuli. Here, conflict avoidance was not observed. Instead, task switches were reduced after conflict trials. In Experiment 3 tasks were used that comprised of univalent or bivalent stimuli. Only tasks with univalent revealed conflict avoidance.

Oral Presentation

The neural bases of proactive and reactive control processes in normal aging

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Research on cognitive control suggests an age-related decline in proactive control abilities (an anticipatory form of control) whereas reactive control (consecutive to conflict detection) seems to remain intact. As proactive and reactive control abilities were associated to specific brain networks, this study investigated agerelated effects on the neural substrates associated to each kind of control. A modified form of the Stroop task was administered to 20 young and 20 older adults in an event-related fMRI experiment. In this version of the Stroop task, three different contexts were created: (1) a mostly congruent context (MC, inducing reactive control) with a majority of congruent items, (2) a mostly incongruent context (MI, inducing proactive control) with mainly interfering items, (3) a neutral context (MN) with mainly neutral items. Preprocessing and statistical analyses were performed with SPM8 ($p<.001$ uncorrected). Behavioral results ($p<0.05$) indicated faster processing of interferent items in the MI than MC context in young participants only. With regard to neuroimaging data, the comparison of the two groups showed that the processing of interferent items in the MI context is associated to decreased activity in (mainly right-sided) frontal and temporal areas in the older group. On the contrary, in the MC context, increased activity was observed in bilateral frontal areas for older compared to younger participants. Behavioral results confirm that older participants have difficulties with the implementation of proactive control that is associated to decreased brain activity (compared to young participants) in areas underlying Stroop performance. However, the recruitment of supplementary frontal areas we observed in the reactive control condition suggests compensation processes. So, ageing seems to differentially affect the neural networks associated to the various kinds of cognitive control.

Oral Presentation

12:10 – 12:30 | Akamas D

Positive and negative mind-wandering relate differently to executive control processes

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Thinking about matters unrelated to one's current task or surroundings is known as mind-wandering and an ongoing debate concerns how it relates to executive control processes. Seemingly opposing hypotheses have posited that executive control is used to minimize mind-wandering in order to optimize task performance or, in contrast, to sustain a coherent stream of mind-wandering mentation by protecting it from external distractions. A recent integrative proposal purports that the relation between executive control and mind-wandering depends on the content of the mind-wandering mentation, suggesting that individuals use their executive resources to increase positive and decrease negative mind-wandering. We tested this idea in 2 studies on individual differences. In the first study, 111 participants completed 4 days of daily-life experience-sampling and 2 laboratory sessions including the Symmetry Span (a measure of working memory capacity), the Stroop task (inhibition), and the Short Imaginal Processes Inventory (positive and negative mind-wandering styles). The negative mind-wandering style interacted with working memory on mind-wandering: working memory was negatively related to mind-wandering in those with high negative style, but positively related in those with low negative style. Inhibition interacted with the positive mind-wandering style. Poor inhibition was related to mindwandering in those with low positive style but there was no relation in those with high positive style. In the second study, 140 participants completed a questionnaire about effortful control, a task-switching test, and a monotonous signal detection test including experience-sampling probes about mind-wandering and valence of recent mentation. Task-switching was more positively correlated with positive than negative mind-wandering. Effortful control correlated with decreased neutral and negative mind-wandering, but not with positive mind wandering. These studies generally support the view that executive resources are positively related to mindwandering in those who typically mind-wander about pleasant topics, and negatively related in those who typically mind-wander about unpleasant topics.

Oral Presentation

12:30 – 12:50 | Akamas D

Is eye contact facilitating of interfering with cognitive processing?

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Previous research has shown that seeing a direct gaze captures and holds visual attention and distracts concurrent cognitive processing. In these previous experiments, the gaze stimuli were photographic images of faces shown on a computer screen. Recent psychophysiological studies from our own laboratory using "live" gaze stimuli have shown that the belief to be seen by another individual plays an important role in the eye contact effect. Against this background, we investigated the effect of centrally presented "live" direct and averted gaze stimuli on detection of laterally presented targets (Experiment 1) and on performance in the Stroop task (Experiment 2) while manipulating participants' belief of whether or not the gazing model person could see them. This manipulation was carried out by a deception procedure. We expected, first, that by using "live" gaze stimuli we would observe strong performance interference by direct gaze stimuli and, secondly, that the performance interference would be attenuated in a condition where the participants believed that the model could not see them. Surprisingly, the results showed that, in the simple target detection task, response times were shorter in the context of direct than averted gaze. Similarly, in the demanding Stroop interference task, independent of the Stroop congruency condition, all the response times were shorter in the context of direct than averted gaze. Moreover, in the target detection task, the response times were shorter for direct vs. averted gaze only when the participants believed that they were seen by the model. In the Stroop task, the response times were overall shorter when the participants believed that the model was able to see them. The present results provide evidence for accumulating views in social cognition research that experimental conditions involving potential for real interaction may result in very different findings compared to experiments lacking this potential.

Oral Presentation

Effects of losing and winning on approach motivation and decision-making

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Many researchers have argued that one of the main functions of the cognitive control system is to monitor lower-level automatic processes, and alter their settings when people make an error or when outcomes are less desirable than anticipated. In the present study, we examined the effect of losses and wins on subsequent approach motivation and decision-making in both gambling (Experiments 1-3) and non-gambling tasks (Experiments 4-5). In each experiment, subjects performed a gambling task in which they had to choose between two options. The first option always represented a sure or guaranteed amount of points to be won; the second always represented a higher amount, but here the probability of winning was less than 100%. After indicating their choice, subjects were told whether they had won or not. After the feedback phase, subjects had to press a key to start the next trial. To examine approach motivation, we measured initiation time of the next trial (start reaction time; RT), probability of gambling, and the latency of the choice response (choice RT). Experiments 1-3 showed that subjects were faster to initiate the next gamble and gambled more after a loss than after a win. In Experiments 4 and 5, subjects alternated between the gambling task and a neutral decision-making task in which they could not win or lose points. Subjects were faster to start the next trial of the decision-making task if they had just lost in the gambling task. This suggests that losses can have a general effect on performance. To conclude, our results challenge the dominant idea that humans adjust performance and increase cautiousness after suboptimal outcomes. We propose that losses are frustrating events that increase approach motivation.

Oral Presentation

Beyond the initial 140 ms, lexical decision and reading aloud are different tasks: An ERP study with topographic analysis

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Most of our knowledge on the time-course of the mechanisms involved in reading is based on the lexical decision task, with very few electrophysiological studies using reading aloud. It has been suggested that the lexical decision task provides a good index of the processes occurring during reading aloud, with only late processing differences related to specific task response modalities. However, both behavioral and fMRI data suggest that print processing differs between the two tasks in core linguistic processes. The characterization of the exact processing stages which differ between lexical decision and reading aloud during print processing remains to be established and requires electrophysiological data. The aim of the present study was thus to carry out an ERP comparison between written strings processing in lexical decision and reading aloud in order to determine when print processing differs between the two tasks. For this purpose, twenty native French speakers aged 20-35 years performed a lexical decision task and a reading aloud task. Crucially exactly the same procedure and material (with words and pseudowords) were used in the two tasks. EEG was recorded continuously using 128 channels and both amplitude waveform analysis and topographic analysis were performed on ERP data from the stimulus onset to 500 ms after. Results reveal that only low-level visual processes are common to the two tasks. Of importance, different electrophysiological patterns on both waveform amplitudes and global topography are found between lexical decision and reading aloud from about 140 ms after stimulus presentation for both words and pseudowords, i.e. as early as the N170 component. Taken together, our main finding questions the use of the lexical decision task as an appropriate paradigm to investigate reading processes and warns against generalizing its results to word reading.

Oral Presentation

11:50 – 12:10 | Lara A - B

Getting to the bottom of orthographic depth: Lexical involvement for words with complex and unpredictable sublexical correspondences

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The Orthographic Depth Hypothesis (Katz & Frost, 1992) proposes cross-linguistic differences in the involvement of lexical processing during reading. In orthographies where sublexical correspondences are complex, inconsistent, and/or incomplete, the decoding process is more difficult and therefore slower. This results in more time for the lexical route to retrieve the relevant information, and a greater relative ratio of lexical processing. Although evidence for this claim exists (Frost et al., 1987; Frost, 1994), it is unclear whether complexity, inconsistency, and incompleteness affect reading processes in the same way, or whether they represent different dimensions underlying orthographic depth. On the linguistic level, there is a dissociation between the complexity of correspondences, and the degree to which words in a language are predictable given its correspondences (van den Bosch et al., 1991). Here, we examine whether correspondence predictability (as indexed by a compound measure of regularity and consistency in English) and complexity (in French) act to increase the relative degree of lexical processing. We expect to find a stronger frequency effect, as a marker of lexical processing, for unpredictable compared to predictable words (English), and for complex compared to simple words (French). This design can confirm whether the mechanism proposed by Katz and Frost (1992) is applicable to different sources of orthographic depth.

Oral Presentation

Transposed letter effects in the absence of basewords

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In order to recognize a visually presented word, its individual letters must not only be identified, but also assigned to their appropriate position for lexical access to occur. One method of exploring this issue has been to examine interference in classifying a letter-string as a nonword when it has been generated through the transposition of a real word (e.g., PALSTIC from the baseword PLASTIC). This is the "transposed letter" or "TL" interference effect. Various models have been proposed to explain this effect, most of which incorporate a matching of the letter combinations found in the stimulus to the stored representation of the baseword. Such accounts would therefore be challenged if TL effects were observed when there is no existing baseword. Consider PILBEN versus TILBEN. Transposition of the I and L creates a legally structured letter-string for the former (i.e., PLIBEN), but an illegal one for the latter (i.e., TLIBEN). The current study suggests that nonword classifications are indeed influenced by the legality of the base nonword and therefore supports a model where there is inexact assignment of letters to their position prior to any attempt at lexical access.

Oral Presentation

12:30 – 12:50 | Lara A - B

Morphological effects on pronunciation

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Converging, albeit inconsistent, empirical evidence suggests that the morphological structure of a word influences its pronunciation. We investigated this issue using experimental phonetic techniques in the context of a novel-word learning paradigm from cognitive psychology. Scottish speakers were aurally trained on nonce nouns and verbs (e.g. zord, to zorr), and tested on speech production tasks that elicited the noun and pasttense forms of the learnt items, yielding apparently homophonous monomorphemic and bimorphemic nonce words (e.g. zord, zorred). We measured the acoustic signal resulting from the speakers' productions, and tracked their tongue movements using Ultrasound Tongue Imaging. Monomorphemic items were realised acoustically with shorter durations than bimorphemic items; however, this difference was not statistically significant. Progressive coarticulatory effects were also observed in the monomorphemic condition for some speakers. A dynamic analysis of the articulatory data revealed that the observed differences in the pronunciations of the two types of items could be due to factors other than morphological structure. Our results, albeit inconclusive, make a significant contribution to the literature in the speech production domain insofar as the presence or absence of morphological effects on pronunciation has important implications for extant theories of speech production.

Oral Presentation

12:50 – 13:10 | Lara A - B

Letter string perception is influenced by regularities in the script

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Humans are known to continuously extract regularities from the flow of stimulation. This occurs in many facets of behaviour, including reading. However, the role of orthographic regularities receives a peripheral status in current theories of visual word recognition. In the present study, we examined to what extent readers are sensitive to bigram frequency and use this information to perceive letters. In Experiment 1, they performed a two-alternative forced choice (2AFC) task. Two letter strings were presented and the participants had to decide which item was the most word-like. The two stimuli differed only on one bigram, which was either of high frequency in French (e.g., RT in DVRTP) or of low frequency (LK in DVLKP). Additionally, the items were either pronounceable (e.g., ARICT/AJOCT) or not (e.g., DVRMP/DVLKP). In Experiment 2, the same participants performed a letter detection task. They had to decide whether a letter was present in a letter string, briefly presented (50 ms). The stimuli were devised so that they were not pronounceable to limit lexical and phonological influences. Critically, the letters to be detected were either included in a high-frequency bigram (e.g., R in RO: WROQB) or in a low-frequency bigram (e.g., N in NU: WNUQB). In the 2AFC task, the participants were highly sensitive to the distribution of bigram frequencies, be it in pronounceable or unpronounceable stimuli. Surprisingly, however, their performance for the two types of stimuli were weakly correlated. Furthermore, the letter detection task yielded a facilitative effect of bigram frequency. Participants were more accurate and rapid to detect letters in high-frequency bigrams than in low-frequency ones. These experiments showed that readers are sensitive to the statistical distribution of letter frequencies of their language and use this knowledge to process letter strings. We discussed the implications of such results for current models of orthographic encoding.

Oral Presentation

Prefixes repel stress in reading aloud: Evidence from surface dyslexia

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The assignment of stress is fundamental for reading aloud a multisyllabic word correctly. In this study, we examined the contribution of prefixes as sublexical cues for stress assignment during reading aloud English disyllabic words. In particular, we tested the hypothesis that prefixes repel stress (Rastle & Coltheart, 2000) by investigating the nature of reading aloud errors committed by patients with acquired surface dyslexia. Five such patients were presented with three types of disyllabic words for reading aloud: 'regular' prefixed words with weak-strong stress pattern (e.g., remind); 'irregular' prefixed words with strong-weak stress pattern (e.g., reflex); and non-prefixed words with strong-weak stress pattern (e.g., biscuit). Results showed that all five patients frequently regularized the strong-weak prefixed words (e.g., pronouncing 'reflex' with second-syllable stress). We argue that these regularization errors are a testament to the functional role of prefixes in stress assignment during reading. Furthermore, we compare simulation results from the rule-based algorithm developed by Rastle and Coltheart (2000), which pronounces disyllables by rule, and the CDP++ model (Perry et al., 2010), which adopts a statistical-learning approach to pronouncing disyllabic words, in order to evaluate how these two opponent theories of reading aloud fare in respect of the patient data.

Oral Presentation

11:50 – 12:10 | Amoroza A

Predictors for academic success and drop-out for students with dyslexia in higher education

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Due to early diagnostics, efficient remediation programs and the implementation of guidance protocols in all levels of education, the impact of learning disabilities on academic life has decreased significantly. This has led to a rise in the number of students with dyslexia (and other disabilities) in institutions for higher education. Nowadays these students can rely on a number of facilities to compensate for their disability. However, little information is available as to whether they manage to succeed in the academic circuit and what factors are important for success. A hundred first bachelor students with dyslexia and a matched control group were tested on a large scale of cognitive measures. After three years (a model trajectory for a bachelor degree) - and again after four years- student administration centers were contacted to obtain student drop-out data and to register whether students had yet obtained their degree. Demographic givens, personality traits and study skills were used to predict drop-out and study success. Being dyslexic has an impact on both study continuance and study success in Flemish institutions for higher education where no pre-entry criteria are applied. In the group of students with dyslexia there is a higher dropout rate, and less students manage to finish their bachelor program within the model trajectory of three years. As reported in the literature for students without disabilities, both personality and learning strategies are also relevant predictors for academic success in this group. A further relevant finding is the fact that the chance of obtaining a degree after three year increases when students actually apply the granted compensatory means. Most importantly, a significant group of students with dyslexia manage to obtain a degree in higher education. The findings of this study can help student guidance centers to further increase the success rate of students with dyslexia.

Oral Presentation

Revisiting the "temporal processing deficit" hypothesis in dyslexia

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Developmental dyslexia is typically associated with a phonological deficit but the origin of this deficit is still a matter of debate. The purpose of the present study was to reexamine Tallal's rapid processing deficit theory according to which phonological deficits are caused by auditory temporal processing impairments. This was done in two experiments. In Experiment 1, we investigated whether such a temporal deficit could be found in speech as well as in non-speech stimuli, and whether it would generalize to other sensory modalities. In particular, we studied how children with dyslexia dealt with temporal judgments in three different tasks: 1/ judgment of segmental duration in a speech perception task, 2/ duration judgment of non speech auditory stimuli, and 3/ duration judgment of visual stimuli. The results showed that children with dyslexia, compared to normally developing age-matched controls, presented deficits when processing segmental durations as well as the duration of non speech auditory or visual stimuli. In the framework of cognitive theories of temporal processing, the deficits we observed may be explained by a dysfunction of the "internal clock" itself or may be secondary to attention deficit. The latter hypothesis has been explored in Experiment 2. The results put all together seem rather in favor of a dysfunction of the internal clock and therefore support Tallal's theory.

Oral Presentation

Oral Presentation

12:30 – 12:50 | Amoroza A

Morphological priming in visual word recognition in dyslexic readers

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Developmental dyslexia is a failure to acquire word recognition skills. It is admitted that this failure results from a deficient representation and use of phonological information which interferes with the ability to establish grapheme-phoneme correspondences. These deficient phonological skills delay the ability to process orthographic information, preventing the dyslexics from developing rapid and automatic word recognition skills. By contrast, dyslexics do not show semantic deficit. Morphological units are the smallest meaning unit in language. The hypothesis that dyslexics could rely on morphological units has been suggested. However, to date, there is little agreement as to whether the ability to process written morphology can develop in spite of decoding difficulties. We used a masked priming word recognition task in order to examine how semantic properties of morphemes influence morphological processing in dyslexia. The task was proposed to dyslexic children, aged 12 year-old (Experiment 1) and to university students with dyslexia (Experiment 2) to examine whether the dyslexic performance was dependant on poor reading skills or remained stable over years. In each experiment, French dyslexic readers as well as reading-level matched and chronological-age matched children performed a lexical decision task. Significant priming effects were observed in all groups, indicating that their lexicon is organized around morpheme units. Furthermore, the dyslexics' processing of written morphology is mainly influenced by the semantic properties of morphemes, whereas children from the two control groups are mainly influenced by their form properties. A similar pattern was found in young adults. These results indicate first that dyslexic children and adults are able to process morphological information in spite of poor reading skills, and second that morphological processing relies on different morpheme properties in normal and impaired readers.

Oral Presentation

12:30 – 12:50 | Amoroza A

Oral Presentation

Neurobiological and behavioral evidence for a serial attentional mechanism in the phonological decoding processing

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Several lines of evidence support the hypothesis that the phonological route, rather than the lexical route, requires efficient visuo-attentional mechanism. In particular, impaired spatial attention has been repeatedly described in dyslexic children showing poor phonological decoding skills. A deficit in the magnocellular-dorsal stream has been hypothesized as the possible neurobiological substrate of the attentional deficit in developmental dyslexia. Here, we investigated the impact of different attentional mechanisms on reading, in proficient readers, using different techniques. In a word naming task, we jointly manipulated two orthographic properties of the stimuli: i.e. lexicality (word vs. pseudo-word) and length (short vs. long) that are diagnostic for the distinction between the lexical and phonological routes. In the first study, we investigated the neurobiological basis of reading aloud delivering single pulse TMS to parietal regions. Both the left angular gyrus, part of the reading network, and the right angular gyrus, part of the attentional fronto-parietal network, slowed down the performance. Crucially, in accordance with the magnocellular-dorsal theory, the stimulation of the area controlling spatial and non-spatial attention was more detrimental especially for processing long pseudo-words. In the second study we evaluated, by means of regression modeling, how different attentional abilities can predict performance in a naming task. Spatial and non-spatial attentional mechanisms accounted for a large portion of variance and again, they were especially involved in explaining the length effect in pseudo-word processing. Our findings confirm that visuo-attentional factors play an important role in determining reading ability and that they can be involved in reading difficulties. Moreover, they support the assumption of computational models, such as the CDP+ model of reading aloud, that phonological decoding requires an efficient attentional mechanism that shifts serially through the sub-lexical units.

Oral Presentation   11:30 – 11:50 | Amoroza B - C

Cognitive mechanisms and neural correlates of confabulation: evidence from classical amnesia and Alzheimer's disease

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Confabulation is a particular symptom observable in amnesic patients who are unaware of their memory deficit, which consists of actions or verbal statements that are unintentionally incongruous to the patient's history background, present and future situation (Dalla Barba, 1993). Clinical and experimental observations have shown that patients who confabulate retrieve personal habits, repeated events or over-learned information and mistake them for actually experienced, specific, unique events. According to the Memory, consciousness and temporality theory (MCTT), (Dalla Barba, 2002), confabulation is not a pure memory disorder, but a disorder involving temporal consciousness (TC). TC means became aware of something as part of a personal past, present or future. In a neuropsychological study, we showed that confabulators, regardless the brain pathology, tend to report as unique and specific personal memories, events or actions that belong to their habits and routines. (Habits Confabulations). (La Corte, 2010). In a longitudinal case study we showed that confabulation can be selective to the three domain of temporal consciousness i.e autobiographical memory, orientation in time and place and foresight of personal future. (La Corte, 2011). In a recent study we investigate this phenomenon whereby confabulators mistake multiplicity, i.e., repeated events, for uniqueness, with an experimental task i.e., events that occurred in a unique and specific temporospatial context. Results showed that confabulators, considered repeated items as unique, thus mistaking multiplicity for uniqueness (Serra, 2014). Altogether our studies suggest that confabulation is related to a dysfunction of TC. We discuss our results within the framework of the MCTT and the others cognitive models proposed in the literature to explain the cognitive mechanisms underling confabulation. Moreover we propose that the hippocampus is the neural correlate of TC, which is lost in classical amnesia and present, but malfunctioning in confabulation. (Dalla Barba & La Corte, 2013).

Oral Presentation

11:50 – 12:10 | Amoroza B - C

The type of concurrent task matters in dual task performance in healthy ageing and Huntington's disease

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Dual tasking is common in everyday life. People routinely perform two tasks at the same time, such as talking while walking. In this talk, I will present research on dual tasking in healthy ageing and Huntington's disease (HD). Do HD patients make more errors when performing concurrent tasks compared with healthy controls? Are older adults slower than younger adults? Does the type of dual task matter? Dual tasking is important for independent living; therefore, empirical work on this topic may inform the development of approaches that compensate for weaknesses in dual tasking due to HD or older age.

11:50 – 12:10 | Amoroza B - C

Oral Presentation

12:10 – 12:30 | Amoroza B - C

Genetic association analyses of personality and cognitive performance in older adults

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Personality and cognitive performance are highly heritable, however genetic association studies have been inconsistent and have mainly focused on younger samples. However, psychological and cortical changes with age may put older adults in a more sensitive range for detecting gene behavior associations. We conducted a genetic association study in a sample of over 600 healthy, cognitive normal older adults (mean age = 69). Cognitive measures (Stroop test measures, Stroop Switch measures, Memory span scores, Simon test measures, and Consonant-Vowel Odd-Even Switching task) and personality trait data (NEO-FFI) were available on participants. Genetic association analysis included COMT rs4680, BDNF rs6265, and DRD2 rs6277. Analyses revealed associations between COMT rs4680 and personality traits of Conscientiousness (p = 0.006), Neuroticism (p = 0.039), and Agreeableness (p = 0.020). Regarding cognitive performance no significant genetic main effects was observed. There was a marginally significant COMT rs4680 x BDNF rs6265 interaction on Stroop reaction time (p = 0.041), which did not survive correction for multiple comparisons. Results showed that BDNF rs6265 A present and COMT rs4680 G absent allele combination might be genetic risk associated with slower response latencies. Results with personality are consistent with the phasic and tonic dopamine release theory. Cognitive performance analyses showed very little relationship with genetic markers, with the exception of an interaction. These results carried out on a large elderly sample failed to replicate the pattern as Nagel et al. (2008) found in a recent study of genetic effects on executive functioning and working memory. Further analysis is needed to explore possible associations of personality and cognitive performance of older adults and their overlapping and distinct genetic background. This work was supported by the National Institutes of Health (P50 AG05861, P01 AG 03991, and PO1 AGO26276 grants) by The Hungarian Scientific Research Fund (K100845 grant) and the Rosztoczy Foundation.

Oral Presentation   **12:30 – 12:50 | Amoroza B - C**

Mechanical problem solving in Alzheimer's disease and semantic dementia

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In recent years, a considerable amount of evidence has stressed that semantic knowledge is neither necessary, nor sufficient to use tools. Rather, it has been suggested that the ability to use familiar and novel tools may be supported by mechanical knowledge. Unfortunately, little is known about the influence of neurodegenerative diseases on this kind of knowledge. Our goal is to fill this gap by exploring mechanical knowledge in patients with Alzheimer's disease (AD; n = 31), semantic dementia (SD; n = 15) and healthy controls (n = 31), using a mechanical problem-solving task. Particular attention was paid to the strategies employed by patients to solve the mechanical problem. Our results showed that AD patients but not SD patients meet difficulties in solving mechanical problem-solving tasks. However, the key finding is that AD patients, despite their difficulties, showed a behavioral pattern of results (including strategies), which is similar to that of SD patients or controls. So, mechanical knowledge in AD might be impaired but not abolished, thus these residual skills could explain why AD patients can use tools in a relatively effective way. To sum up, our findings suggest that mechanical knowledge may have a critical importance compared to conceptual knowledge in the ability to use familiar tools. We will also discuss our results in light of those obtained in left brain-damaged patients with tool use disorders, in whom mechanical knowledge is severely impaired, compared to AD and SD patients.

Oral Presentation

Measuring the approximate number system in ageing: Methodological variations yield different results

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Research measuring the approximate number system (ANS) has largely focused on abilities in children, with little study into ANS acuity in ageing. Those measuring the ANS in older adults have reached opposing conclusions, with some suggesting a decline in acuity and others reporting no negative effect. The ANS is most often measured with the use of comparison tasks, whereby participants view briefly displayed sets of coloured dots and select the set with the largest numerosity. ANS tasks must control for perceptual variables (e.g. surface area) to ensure participants make judgments based on numerosity alone. Therefore, during some trials, factors such as surface area are uncorrelated with numerosity (incongruent trials). Such trials are suggested to require inhibitory control, as the salient but incongruent surface area must be ignored to make a numerosity judgment. Findings of impoverished ANS acuity in ageing may therefore reflect a decline in inhibitory control. Varying results could also be due to different methodological factors, such as whether dots are displayed intermixed (blue and yellow dots appear anywhere on-screen) or separately (blue and yellow dots appear on separate sides of the screen). In the current study, dot display was manipulated to investigate the effect of using intermixed or separate displays on ANS acuity in younger (18-25) and older (60+) adults. Results showed that ANS acuity (measured by Weber fractions, accuracy and RTs) was poorer during intermixed compared to separate displays for all participants. Further, in the older group, mixed displays increased the adverse effect of incongruent trials on ANS acuity. The findings may therefore provide an explanation for contradictory conclusions on the effect of ageing on ANS acuity. Further, the results have implications for research investigating the relationship between the ANS and mathematical achievement, as dot display type may mediate such a link.

Oral Presentation

11:30 – 11:50 | Amoroza D

Focusing on goal relevance – is it crucial for artificial grammar learning?

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Eitam, Schul and Hassin (2009) demonstrated that focusing on relevant dimension of sequence was necessary for artificial grammar learning to occur. Participants were exposed to sequences of stimuli that varied in two dimensions (colours and letters) i.e. letters were presented on coloured backgrounds. The order of background colours and the order of letters were determined by different grammars. In one group the attention was oriented to learning letters, in second - to colours. In both groups the artificial grammar learning process was observed; however, participants learned only the grammar that their attention was directed to. The aim of our studies was to demonstrate which of the grammars (letters or colours) is acquired spontaneously, without explicit instruction. In study 1 we used a very similar paradigm in which we presented coloured letters. We observed a spontaneous learning of letters-order rule and no learning of colours-order rule. To verify if difference between grammar rules complexities affected the above results, we used exactly the same grammar for letters and colours in study 2. We replicated results from study 1. We interpreted these results as spontaneous attention oriented towards the aspect of stimuli that is processed more automatically. Namely, reading is more automatic than naming colours. In our studies the colours belonged to letters, so they may have been perceived as a secondary feature and hence their learning could have been impaired. To avoid this effect, we conducted a third study where colours were presented in the background of black letters. We replicated the pattern of results from both studies. Overall, the studies demonstrate that implicit learning process can be observed in both conditions - with and without explicit instruction to focus on the specific aspect of the stimuli. In case of spontaneous learning people acquire knowledge connected to more automatic processing.

Oral Presentation

Single vs. dual process theories of contingency learning: Is the evidence of dissociations between measures conclusive?

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The standard paradigm used in contingency learning experiments consists of the presentation of a series of occurrences of a potential cause and an outcome, followed by a judgment about the perceived contingency between them. When the actual contingency is zero, participants are usually biased by the frequency of occurrence of the two events, thus emitting higher judgments (i.e., density biases). Previous research reported that density biases can be found only in judgments, but not in indirect measures that allegedly tap on more basic associative processes. The dissociation between judgments and other measures was used to support a "dual-process" view of contingency learning according to which an associative process encodes contingency and subsequent higher order processes bias the judgment. In our current study, we review the published findings supporting a dual-process model based on dissociations between judgments and three different dependent measures. Using three strategies (meta-analysis, reanalysis of previously published data, and simulations), we argue that the evidence of such dissociations is actually weak: some can be attributed to methodological artifacts, and others are not generalizable or are difficult to replicate. Therefore, it is too soon to conclude that dual-process models are necessary to account for density biases in contingency learning, at least on the basis of dissociations between measures.

Oral Presentation

Studying implicit learning across multiple test sessions in a web-based experiment

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Implicit learning is usually studied in laboratory settings over a restricted time span lasting for less than an hour (e.g., Berry & Broadbent, 1984; Nissen & Bullemer, 1987; Reber, 1967). In everyday situations, implicit learning is assumed to involve a gradual accumulation of knowledge across several learning episodes over a larger time span (Norman & Price, 2012). One way of increasing the ecological validity of implicit learning experiments could be to present the learning material repeatedly across shorter experimental sessions (Howard & Howard, 1997; Cleeremans & McClelland, 1991). This can most easily be done by using a webbased setup that participants can access from home. We created an online web-based system for measuring implicit learning that could be administered in either single or multiple sessions. As few attempts have been made to combine different implicit learning tasks within the same experiment, an additional aim was to compare performance in an alternating serial reaction time task (ASRT; Howard & Howard, 1997) and a dynamic system control task (DSC; Berry & Broadbent, 1984). Participants (N=60) were randomly assigned to either a single-session or a multi-session condition. Learning and the degree of conscious awareness of the learned regularities was compared across condition (single vs. multiple sessions) and tasks (ASRT vs. DSC). Findings will be presented at the conference. Advantages and disadvantages of using web-based tools to study implicit learning will also be discussed.

Oral Presentation

12:30 – 12:50 | Amoroza D

Effects of task representation on learning and behavior

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Medial and dorsolateral prefrontal cortex (mPFC/dlPFC) are generally recognized as core components of the cognitive control network. Although coactivation of the two regions is routinely observed, their unique contribution to behavior remains a topic of intense debate. MPFC, especially dorsal anterior cingulate, has been ascribed a range of functions, including detecting and processing behavioral error, resolving behavioral conflict, reward prediction, learning the value of actions, and many others, while dlPFC appears to be involved in representing rules and task-sets required to perform a task, especially over extended periods of time, maintaining information related to higher order task structure, and signaling prediction errors in model-based reinforcement learning frameworks. A new computational model of mPFC/dlPFC, the Hierarchical Error Representation (HER) model, proposes that errors signals generated by mPFC serve to train error representations in dlPFC, which may then be associated with task-related stimuli that reliably precede behavioral error. Once trained, error representations maintained in dlPFC modulate mPFC predictions regarding the likely outcomes of actions. The HER model, based on a previous model of dACC/mPFC (Alexander & Brown, 2011), accounts for a range of effects observed in mPFC and dlPFC from fMRI, EEG, lesion, and single-unit studies. In addition to capturing effects from studies investigating the neural bases of cognitive control, the HER model makes additional predictions regarding behavior during learning tasks in which a person is required to integrate multiple sources of information in order to respond appropriately. Using a novel version of the Stroop task, we manipulate the relative salience of two sources of information while participants attempt to learn correct responses to conjunctions of word name and font color. In agreement with the predictions of the HER model, participants learn the task more slowly when relevant information is less salient, with accompanying differences in response times and error identity.

Oral Presentation

Measuring strategic control in implicit learning: Methodological and theoretical considerations

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Within various implicit learning paradigms, different methods have been developed for measuring the extent to which acquired knowledge can be applied in a strategic, flexible manner. Examples include generation exclusion tasks in SRT learning (Goschke, 1998; Destrebecqz & Cleeremans, 2001) and two-grammar classification tasks in AGL (Dienes, Altmann, Kwan, & Goode, 1995; Norman, Price, & Jones, 2011). Strategic control has traditionally been used as a criterion for distinguishing between knowledge which is consciously available and knowledge which is not. For instance, methods based on the Process Dissociation Procedure (Jacoby, 1991), in which performance is compared under conditions where participants are instructed to apply versus withhold certain knowledge, are frequently used as criteria for determining the extent to which learning is implicit or explicit. However, measures of strategic control can also be used as part of a broader assessment of which properties of knowledge the person is aware or not aware of during implicit learning (e.g., Norman, Price, Duff, & Mentzoni, 2007; Norman et al., 2011). At a more general level, research on whether and how implicitly learned knowledge can be strategically controlled can furthermore contribute to the larger debate concerning the relationship between cognitive flexibility and consciousness (e.g., Schmidt, Crump, Cheesman, & Besner, 2007; van Gaal & Lamme, 2012). In this talk we present an overview of existing methods that have been developed for measuring strategic control within traditional implicit learning paradigms, addressing the theoretical rationale behind these methods as well as theoretical and methodological strengths and limitations. Some important findings will be summarized, and some directions for future research will be suggested.

Oral Presentation

Construction of a scale designed to evaluate attention deficits at work

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More and more studies have shown that highly demanding work environment have negative effects on attention. It was suggested that repeated exposure to a stressful workplace could generate a new occupational disease that starts during adulthood, entirely caused by the environment, the Attention Deficit State (ADS). ADS mimics the symptoms of Attention Deficit/ Hyperactivity Disorder (ADHD), which emerges during childhood. ADS could be cause in part by the frequent interruptions at work and the extensive use of Information and Communication Technologies (ICT). We built the Attention Deficit State Scale (ADSS), a selfrated scale that ask participants to rate questions about cognitive complaints during childhood (before 12yo) and adulthood, the higher the scores, the higher the impacts. The difference between these two periods of life (DAC) could attest of the presence of ADS. In order to validate this scale, three studies were conducted on 417 subjects that were either employed or unemployed. The first study was conducted on 188 subjects (61M/127F, 139UN/49EM, 20.5 structure had 3 factors (Inattention & Disorganization, Mental Overload, Changes in conducts). Also, the DAC seemed a satisfactory measure to attest of the presence of an ADS (Chronbach = .78). The second study, conducted on 179 subjects (43M/136F, 121UN/58EM, 20.9 3.8 yo), replicated the factorial structure. Also, results on the ADSS strongly correlated with scales evaluating ADHD. Finally, results seemed linked with the frequency of interruption and ICT use. The third study, conducted on 50 subjects (15M/35F, 40UN/10EM, 19.3 of the scores of the three factors with behavioral tasks that targeted the same constructs. In conclusion, the ADSS provides good psychometric properties and could be used for researches about cognition at work.

Oral Presentation

The task shapes the mind: Can divergent thinking broaden your attention?

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A narrow field of attention allows deep-level processing (intensive attention), while a broad field of attention comes at the expense of shallow-level processing (extensive attention) (Kolańczyk, 2011). Studies based on the Construal Level Theory have shown that extensive attention facilitates performance in idea generation, but not in analytical tasks. However, little is known about an inverse relationship – how performing different tasks affects attention. We predicted that solving an open (divergent) task broadens the attentional field. Participants (N = 90) were solving a divergent (idea generation) or convergent (analytical logical puzzle) task for 1.5 minute, when they were asked to proceed with the Ellipses Test (a reliable and valid measure of attentional breadth). 363 different letters were arranged in the shape of ellipses on a single screen. Participants had to select "d" letters with a mouse click. Some "d"s were spread out separately and others appeared in clusters – these were easier to spot in the extensive attention state. We used the distances and reaction times between selections as indicators. Extensive attention is operationalized as high average (long "jumps" between selections), big standard deviation (SD; short "jumps" within clusters and long "jumps" among clusters) and long total distance (broad perceptual field). We found that all indicators of distance were significantly higher directly after the divergent task (average Cohen's d = .53). Participants who solved a divergent task also obtained significantly longer mean reaction times, and bigger (p = .063) SD of the reaction times. The tasks have strongly affected the attentional breadth: multidirectional search for a solution during idea generation broadened the field of attention, while aiming at a single correct solution in a logical puzzle – narrowed it. Implications for the creative process are discussed. Future studies could employ an eyetracker and examine the depth of processing.

Oral Presentation

The strength of spatial orienting of attention is mediated by implicit learning

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Voluntary orienting of spatial attention is typically investigated by presenting unilateral visual targets preceded by central arrows characterized by two distinct functional properties; directionality (i.e. indicating where attention has to be shifted) and predictivity (i.e. informing where the target is more likely to appear). Recently, a wealth of studies showed that, for arrow cueing, predictivity is not a necessary condition to obtain covert shifts of spatial attention. The goal of our study was to assess whether covert shifts of spatial attention could arise when removing both directionality and predictivity. We were particularly interested in determining whether implicit learning could influence performance in a task which is thought to subsume voluntary processes only. We asked participants to judge the orientation of a unilateral Gabor grating preceded by a centrally-presented colour cue (non-directional), informing them about the side (either left or right) where they had to orient attention. Unknown to participants, cue predictivity was manipulated across blocks, whereby the cue was predictive for half of the experiment, but unpredictive in the other half. Results show that reliable shifts of spatial attention were induced even when (non directional) cues were non predictive of target location. Moreover, cue predictivity (proportion of valid trials) emerged as a major determinant of the strength of spatial orienting, whereby predictive cueing led to larger validity effects. The cueing effects were unrelated to the subjective estimates made by the participants regarding cue predictivity. These new findings suggest that implicit learning could account for a number of characteristics usually attributed to voluntary attention when systematic regularities linking cue characteristics with target position are present.

Oral Presentation

The handle-to-hand correspondence effect: evidence of a location coding account

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Responses to graspable objects are faster and more accurate when the responding hand is aligned with their left- rightward handles, compared to when it is not - handle-to-hand correspondence effect. According to the affordance activation account, this effect depends on the activation of a hand grasping gesture proper to the identity and function of the perceived object (i.e., affordance effect). However, according to the alternative location coding account, the handle provides a salient visual asymmetry which is spatially coded, and overlapping with the response alternatives (left-right). This results in the advantage of spatially corresponding over the non-corresponding responses irrespective of the stimulus graspability (i.e. Simon effect). The Simon effect depends on the spatial representation of stimulus and response alternatives. Indeed, it disappears if a single-button go-nogo task is used in which no response alternatives can be coded, whereas it reappears when a joint go-nogo task is performed in parallel by two participants. An affordance effect, instead, is expected to be independent of S-R spatial representations. In the present study we investigated on the origin of the handle-to-hand correspondence effect. In two experiments, participants responded to the upright/upside-down orientation of centrally presented objects while ignoring their handles orientation. In Experiment 1 they pressed a response button; in Experiment 2 they executed a precision grip towards the objects handle. A go-nogo task (Exp. 1a and 2a) and joint go-nogo task (Exp. 1b and 2b) were implemented. Results showed a non-significant handle-to-hand correspondence effect in the go-nogo tasks (Exp. 1a and 2a), and a significant effect in the joint go-nogo tasks (Exp. 1b and 2b). These results suggest that the handle-tohand correspondence effect shares with the Simon effect the need for the spatial representation of the response alternatives and support the location coding against the affordance activation account.

Oral Presentation

Top-down inhibition of return

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Inhibition of return (IOR) refers to the slowing of response times to targets presented at previously inspected locations relative to new locations, when spatial cues to attract attention are non-predictive, and the time between the cue and the target is above 250 ms. In the last years there has been a debate about the mechanism accounting for this effect. Initially it was proposed that this effect results from the inhibition of attention to return to an already explored (irrelevant) location; whereas more recent alternative theories have proposed habituation (Dukewich, 2009) and object-file integration process (Lupianez, 2010). In the present study we designed an experiment to elicit IOR in a top-down context where the predictiveness of the peripheral cues was manipulated trial-by-trial within a block, and flagged by the colour of the cue (red = 80% validity; blue = 50% validity). This experiment was designed to study the neurophysiological (ERPs) processes locked to the cue processing (attend vs ignore) and orientation to the target (valid vs invalid) so as to shed light on the mechanisms underlying IOR. Results showed that with predictive cues there were significant facilitatory effects for all SOA conditions (800, 1400 and 2000 ms); whereas for non-predictive cues, although there was a tendency for inhibitory effects at all SOA conditions, this effect (an IOR effect of 11 ms) was only significant for the 1400 SOA. The findings show that IOR can be observed in a context where there is top-down information about the predictiveness (relevance) of the cue, and when the majority of the overall trials are valid. This manipulation seemed to affect the time course of the effects, since IOR appeared rather late. We discuss this finding in the light of the ERP data.

Oral Presentation

Cognitive load does not facilitate the emergence of structure during iterated pattern reproduction

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In cultural transmission studies, iterated reproduction of complex stimuli leads to increased transmission accuracy and structure (Kirby, Cornish & Smith, 2008). Previous research demonstrated that structure, estimated as reduction in algorithmic complexity, emerges faster in children compared to adults (Kempe, Gauvrit & Forsyth, 2015), in line with the Less-Is-More-hypothesis, according to which children's limitations in working memory capacity and executive control are responsible for regularization of inconsistent inputs. In this study, we performed a direct test of whether processing limitations, induced by concurrent cognitive load, facilitate emergence of structure. Nine chains with 10 adult participants per chain briefly viewed a random dot pattern superimposed onto a complex visual scene taken from the 'Where Is Wally?'-series of illustrated books, before attempting to reproduce the pattern by placing dot stickers on an empty grid. Each reproduced pattern served as input for the next participant in the chain. We found that complexity reduction with concurrent load did not differ from complexity reduction without concurrent load. However, transmission accuracy was impaired with concurrent load. Further analyses of the data revealed that rather than reducing complexity, cognitive load was associated with impaired memory for the spatial location of the patterns. Unlike children, who maintain transmission accuracy by injecting innovations that drastically reduce complexity to render patterns learnable, cognitive load in adults does not affect amount of complexity reduction thereby incurring costs in transmission accuracy. We suggest that complexity reduction is determined by pre-existing biases, i.e. in the case of random dot patterns, by knowledge about typical action routines and spatial configurations, and that during iterated reproduction children are simply biased by less complex priors than adults. These findings suggests that data compatible with a Less-Is-More account may in fact reflect effects of children's restricted repertoire of simpler biases rather than effects of cognitive processing limitations.

Oral Presentation

Retroactive dual-task interference in memorizing and responding to visual targets: Data and theory

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In a recent study, Nieuwenstein and Wyble (JEP:General, 2014) showed that the consolidation of a masked visual target can be disrupted for up to one second by a trailing 2-alternative forced choice task. Aside from demonstrating that working memory consolidation involves a time-consuming process that continues after a mask, the results of Nieuwenstein and Wyble are remarkable in demonstrating retroactive interference (RI) with little to no proactive interference (RI) – the opposite of what is typically found in studies on the attentional blink and psychological refractory period effect. Here, we show that the reversal from PI to RI depends on the probability of T2 presence (p[T2]), such that a high p(T2) results in strong PI with little RI whereas a low p(T2) results in strong RI with little PI. To explain these findings, we propose that the degree of PI and RI reflects the workings of an attentional control mechanism that aims to protect T1 consolidation against interference, and that is applied in accordance with the risk of such interference. In this view, a high p(T2) entails a high risk of interference with T1 processing, and this results in the protection of T1 at the expense of a postponement of T2 processing. Converely, a low p(T2) means that the risk of interference is low and this entails that T1 is left vulnerable, while T2 can be processed unabated. Consistent with this account, we show that if the risk of interference with T1 processing is increased by embedding the targets in an RSVP stream of distractors, we find strong PI with little RI even when p(T2) is low. Aside from offering a new perspective on dual-task interference, this work makes clear that attentional control plays a central role in phenomena observed in studies using RSVP.

Oral Presentation

15:00 – 15:20 | Akamas B

Can the relationship between working memory and affect be moderated by reinforcement sensitivity?

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Several recent studies have hinted at a relationship between working memory modality and positive/negative affect distinction. Gray (2001) demonstrated that positive affect can enhance verbal working memory and impair spatial working memory while negative affect can enhance spatial working memory and impair verbal working memory. Furthermore, Storbeck & Watson (2014) observed that completing a verbal or spatial working memory task can modify strategic and automatic reactions to positive and negative stimuli. Completing the verbal task prompted more positive endorsement of verbal and pictorial stimuli, while completing the spatial task prompted more negative endorsement of the same material. Since the link can be explained in terms of approach and avoidance motivation we tested the hypothesis that reinforcement sensitivity could moderate the observed effect. Using Carver & White's (1994) BIS/BAS scale we divided the sample of 80 university students with respect to BIS and BAS medians. Using the method similar to that described by Storbeck & Watson (2014) we observed the effects of verbal and spatial working memory tasks on the endorsement of verbal stimuli with respect to the high and low BIS/BAS groups. The results are discussed in terms of motivational influences on working memory.

Oral Presentation

Searching for the source of the action advantage in following instructions: Evidence for a temporary motor store within working memory?

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Working memory supports the retention and implementation of spoken instructions, as evidenced by dual-task studies in which tasks designed to disrupt all three components of Baddeley & Hitch's (1974) working memory model impair the ability to follow instructions. The existing three components do not, however, capture all aspects of instruction-following. In particular, the recall of instructions is consistently more accurate if participants are required to physically perform rather than verbally repeat the information. This performance advantage is undiminished under dual-task conditions and has no obvious source within working memory. To explain this effect, we propose that the spatial, motoric, and temporal features of planned actions are encoded in an as yet unspecified temporary store within working memory. Although the notion of a store for movement trajectories and kinaesthetic representations has been proposed previously, the processing and storage of tactile-kinaesthetic information is often subsumed within the visuospatial sketchpad. In the current study we tested immediate memory for sequences of spoken instructions by both action-based and spoken recall. In addition to classic interference tasks known to selectively disrupt the phonological loop, visuospatial sketchpad, and central executive, we included two motor suppression tasks designed to impair the encoding and retention of motoric representations. These required participants to produce short repetitive sequences of either fine (Exp 1) or gross (Exps 2 & 3) motor gestures. Across all experiments, the ability to perform or repeat back spoken instructions was impaired by all concurrent tasks. However, the performance advantage was only abolished when the interference task required participants to produce gross motor movements, suggesting that the performance advantage at recall depends on the formation of temporary motoric representations of planned action sequences. This supports the idea that there may be a cognitive system dedicated to the temporary maintenance of spatial-motoric representations.

Oral Presentation

The impact of crossmodal correspondences on working memory performance

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Evidence in favor of Crossmodal Correspondences (CCs) have been collected both in infants and adults for different sensory modalities and dimensions in the perceptual domain, using speeded categorization or comparison tasks. However, it is still largely unexplored whether CCs can also modulate post-perceptual processes, such as Working Memory (WM). We investigated this issue in 2 Experiments, using a bimodal (audio-visual) 2-back task. In Experiment 1 we considered three kinds of CCs typically used in the perceptual domain: pitch/shape, pitch/elevation, and audio/visual numerosity, each presented congruently (e.g., for numerosity: three tones along with three shapes) or incongruently (e.g., three tones along with two shapes). Participants were divided in three groups according to the attended modality: vision, audition, or both. The results showed an overall impact of the different CCs on the n-back task performance, highlighting faster target-detection latencies following congruent vs. incongruent CCs, especially in case of numerosity matching. Experiment 2 focused on numerosity congruence/incongruence and confirmed these results, but only when the audiovisual correspondence remained stable and congruent between the sample and target display (i.e., when the two displays were audiovisually congruent and identical). This indicates that the enhancement of WM performance reflects the on-line maintenance of an integrated audiovisual representation involving the auditory and visual components of the CC, and not a mere arousal effect driven by the current congruent CC. Moreover, the two Experiments present evidence of an asymmetrical congruence effect across different sensory modalities (e.g. congruence effect on WM is maximized when attention is focused on auditory stimuli). Overall, these findings extend the existing knowledge about the influence of CCs on post-perceptual processing. Importantly, the impact of CCs in enhancing memory representation can contribute in shedding new light on the link between perceptual and post-perceptual, learning-mediated, stages of processing.

Oral Presentation

14:20 – 14:40 | Akamas C

The predictive chameleon: Evidence for anticipated action

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Observing an action automatically triggers a corresponding motor representation in the observer. However, research on ideomotor action and more recent theoretical accounts, such as predictive coding accounts have put forward the idea that such motor simulation serves an anticipatory function. Based on such predictive accounts, but in contrast to classical perception-action theories, we assumed a motor simulation system in observers that simulates a predicted movement before an actor has executed it. In 3 studies we presented two videos (each 10 minutes long) of an actor whose nose was wrinkling or whose hair was falling into the face. Crucially, the actor did not engage in any hand or arm movements. While watching the videos, participants were videotaped. Afterwards, we coded how often participants engaged in two classes of behavior. Study 1 found that when watching the nose wrinkling video, participants engaged in more anticipated nose wrinkling actions (e.g., nose scratching) than in anticipated hair falling actions (e.g., hair stroking) and vice versa for watching the hair falling video. Study 2 demonstrated that this effect is stronger when the observed model has a strong desire to act, compared to when the actor has a weak desire to act. Study 3 replicates the findings by applying motor TMS to measure participants' muscle activity in the biceps. In general, our findings suggest that motor co-representations are based on anticipatory mechanisms. Moreover, it demonstrates the existence of a link between inferring another person's desire to move and the release of an action that matches this desire.

Oral Presentation

14:20 – 14:40 | Akamas C

Oral Presentation

Does recent action execution experience benefit action imagery?

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Action imagery relies on memories or internal models of the imagined action. Imagination should therefore be more similar to execution if an action has just been executed (updating of internal models) and if actions are familiar (existence of stable internal models). In order to investigate the role of prior action execution and action familiarity two experiments were conducted in which participants executed and imagined a familiar and an unfamiliar action (Experiment 1: walking vs. jumping using one leg; Experiment 2: typing as usual vs. typing using one finger). The same action mode (imagination, execution) was repeated 5 times in alternation for each familiarity condition. Results showed that execution and imagination durations became more similar with repeated performance (Experiment 2), and that correlations between imagination and execution durations increased with repetitions (Experiment 1 and 2), in particular in unfamiliar actions (Experiment 2). In conclusion, imagination of actions improves based on recent execution experience. Even performing an action only once results in higher accuracy of subsequent imagery, in particular if the action is unfamiliar. Action execution may lead to an update of internal models, which benefits imagery.

Oral Presentation

15:00 – 15:20 | Akamas C

Large pupils predict goal-driven eye movements

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Here we report that large pupils predict fixations of the eye on low-salient, inconspicuous parts of a visual scene. We interpret this as showing that mental effort, reflected by a dilation of the pupil, is required to guide gaze towards objects that are relevant to current goals, but may not be very salient. When mental effort is low, reflected by a constriction of the pupil, the eyes tend to be captured by high-salient parts of the image, irrespective of top-down goals. The relationship between pupil size and visual saliency was not driven by luminance, nor a range of other factors that we considered. Crucially, the relationship was strongest when mental effort was invested exclusively in eye-movement control (i.e. reduced in a dual-task setting), which suggests that it is not due to general effort or arousal. Our finding illustrates that goal-driven control during scene viewing requires mental effort, and that pupil size can be used as an on-line measure to track the goaldrivenness of behavior.

Oral Presentation

Measuring task set preparation versus mind wandering using pupillometry

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In two studies, we investigated participants' task set preparation by measuring changes in pupil diameter as they prepared for an easy (i.e., prosaccade) or difficult (i.e., antisaccade) task. Past research has shown phasic changes in pupil diameter to validly measure cognitive effort expended during difficult tasks. Participants were given a 500 ms task cue to direct their eye movements either toward or away from a flashed stimulus in order to detect a target stimulus presented on the same (i.e., prosaccade) or opposite (i.e., antisaccade) side of the screen. A remote-controlled infrared eye camera measured pupil diameter during the post-cue fixation period, which lasted between 500-8000 ms and preceded the flashed stimulus. Occasional thought probes were also presented on 17-25% of the trials asking participants what they were thinking about during the trial, with possible responses categorized as "on-task" thoughts versus "off-task" thoughts (i.e., mind wandering). In both studies participants' pupil diameters were larger when anticipating an antisaccade task relative to a prosaccade task, especially among individuals higher in working memory capacity (WMC). In contrast, participants' self-reported mind wandering depended upon whether the thought probes occurred immediately after their target detection response (Experiment 1) or instead occurred in lieu of the stimulus (Experiment 2). In the latter case, self-reported mind wandering echoed the pupil diameter changes in demonstrating greater off-task behavior when participants expected to perform the prosaccade task. Moreover, under the valid self-report condition in Experiment 2, task differences in pupil diameter emerged only when participants reported being "on-task," but disappeared during periods of mind wandering. Results demonstrate that (1) pupil diameter is a valid index for attentional preparation versus mind wandering and (2) high WMC individuals more flexibly use expected task difficulty to regulate attentional preparation versus mind wandering.

Oral Presentation

Dissociated representations of deceptive action intentions and movement kinematics in the observer's motor system

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Understanding other's intentions by observing their movements is crucial in social interactions. Previous work showed that action simulation plays a key role in detecting others' deceptive intent. Indeed, during action deception discrimination tasks, seeing an actor deceiving about the weight of an object facilitates the observers' motor activity more than seeing him acting truthfully. This facilitation for deceptive actions has been held to suggest that motor resonance is sensitive to action intentions. However, an alternative explanation is that the motor system facilitation mirrors the alteration of movement kinematics to attain deceptive vs. truthful actions. Here, we directly tested these two alternative hypotheses by using single-pulse transcranial magnetic stimulation (TMS) to measure corticospinal excitability (CSE) from hand and forearm muscles during a weight discrimination task. Participants watched videos of an actor lifting a cube and judged whether the cube was heavy or light. The videos were taken in three conditions in which the actor was asked to lift the cube after receiving truthful information on the object weight and being asked to provide either i) truthful (true condition) or ii) deceptive (deceptive condition) cues to the observers as well as iii) after receiving fooling information and being asked to provide truthful cues to the observer (deceived condition). This way, we independently manipulated actor's action intention and kinematics alterations. Results showed that, in keeping with previous studies, CSE increased during the observation of deceptive actions; however, a decrease of CSE was obtained in the deceived vs. the true and deceptive conditions. Importantly, while deceptive actions enhanced CSE for both muscles, perceiving kinematic alterations affected CSE in a body part specific manner. This suggests that deceptive intention is actually coded by the observer's motor system and different hierarchical levels of action representation may modulate its activity via dissociable processes.

Oral Presentation

14:20 – 14:40 | Akamas D

Self-organized versus externally controlled multiple cognitive task requirements

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Multiple cognitive task requirements are a societal fact and one can hardly avoid them. This study aims to identify conditions that support multitasking and to elaborate how persons deal with multiple cognitive task requirements. We compare conditions in which participants themselves organize how to cope with multiple cognitive task requirements with conditions in which task organization is externally controlled and thus task scheduling is pre-determined. Participants were requested to perform four different tasks. The respectively next items for the four tasks were presented in parallel and consequently participants could use this preview to operate on the tasks simultaneously. In the "free choice condition", participants themselves indicated which task they performed in each trial. In the "cued task condition", a cue indicated which task to perform next. To control for task transition effects a yoked design was applied. For each participant in the free choice condition, there was a yoked person in the cued task condition who worked through the items of the four tasks in exactly the same order. The study revealed three rather unexpected results. (1) Participants responded faster in task switch than task repetition trials because of the possibility to preview the next item of each alternative task. (2) The free choice setting revealed a tradeoff between switch benefits due to preview on the one hand and a tendency to avoid task switches due to the necessity of reconfiguration on the other hand. (3) When comparing participants in the free choice condition with participants in the cued condition regarding performance in task switch trials and measures of fatigue / stress, results diverged: Participants in the free choice condition responded faster, yet revealed higher fatigue/stress values than participants in the cued condition probably because the task choice process supports to optimize task performance yet itself is demanding.

Oral Presentation

Priority shifts in dual-task control - response scheduling strategies in crossmodal action

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An important aspect of cognitive control in multitasking is temporal response scheduling, especially when responses must be initiated sequentially (PRP paradigm). Although previous studies have already revealed important determinants of response scheduling, it is still unknown to what extent scheduling schemes can be strategically adjusted dependent on the explicitness of response execution order requirements, especially when response modalities with different a priori processing priorities are involved. In the present PRP study, we examined (compatible vs. incompatible) manual and oculomotor responses (the latter being known to be prioritized over the former) under different degrees of explicitness of response order requirements. In Experiment 1 and 2 stimuli were presented in random order with positive and negative SOAs. While in Experiment 1 we did not provide any specific response order instruction, participants in Experiment 2 were explicitly instructed to respond in accordance with stimulus presentation order. Experiment 3 only contained positive SOAs (implicit suggestion of a fixed order strategy). The comparison of identical trials across experiments revealed that a) a priori prioritization of response modalities cannot be completely overridden by instructions or contextual task characteristics (even if this leads to decreased performance), and b) response scheduling schemes are highly context-dependent and can be strategically adapted to particular task requirements.

Oral Presentation

15:00 – 15:20 | Akamas D

Individual differences in response control tasks understood through competitive accumulation models

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Several tasks in cognitive psychology require individuals to make rapid decisions in the presence of conflicting information, such as the Stroop or antisaccade tasks. An individual's performance in these tasks is typically assumed to reflect a response control dimension, though recent empirical and theoretical work has highlighted this as an oversimplification. Not only do response control tasks show surprisingly little correlation with each other, it is not clear whether different measures from the same task (e.g. error costs or reaction time costs) reflect the same aspect of performance. This is problematic for both theoretical and applied research with these tasks, as the justification for using one measure over another is often not explicit. Here we show, for a variety of response control tasks in both published and unpublished data, that RT and error costs often do not correlate. We show that this counterintuitive pattern can be easily accounted for within a framework of competitive accumulator models. In contrast to a unitary characterisation of cognitive control, these models capture the control element of performance in (at least) two distinct ways. The first corresponds to the mean accumulation rate, with lower levels producing both increased RTs and error rates to conflicting stimuli. The second corresponds to response threshold, with lower levels producing increased error costs but reduced RT costs (because subtraction of non-conflict from conflict conditions does adequately control for threshold changes). This framework thus separates an individual's efficiency of processing in the face of conflict from the way they strategically trade-off speed for accuracy. Both facets of performance are important for understanding action control and are conceptually related to impulsivity, but their opposing effects are lost in traditional measures of response inhibition.

Oral Presentation

Demands on executive functioning can differ among monolinguals: Switch cost profiles in balanced vs. unbalanced bidialectal speakers

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One potential reason behind failures to replicate a bilingual advantage in executive functioning may be associated with different demands on inhibitory control among speakers considered to be monolingual (Kirk et al, 2014). Specifically, in many parts of the world, speakers are fluent in several linguistic varieties, and often switch between these varieties freely. For example, in situations of diglossia, speakers use a regional variety alongside a standard 'high' variety of their native language; however these varieties are not considered separate languages, nor are their speakers considered bilingual. To investigate whether these similar varieties are represented as different linguistic systems we adapted the language switching paradigm (Meuter & Allport, 1999) for use with bidialectal speakers of Standard Scottish English (SSE) and Dundonian, a regional dialect of Scots. We tested participants who routinely switch between SSE and Dundonian in everyday life ('active users'), participants with passive knowledge of Dundonian who reported only using SSE in everyday life ('passive users'), alongside participants who spoke Standard Anglo-English and only reported cursory exposure to Dundonian ('non-users'). Self-reports were corroborated by expert ratings of authenticity of Dundonian pronunciation, which did not differ between active and passive users but was significantly worse for non-users. Participants were cued to name pictures either in Standard English or in Dundonian. Half of the picture names were cognates differing only in pronunciation (e.g. 'house' vs. 'hoose'); the rest were noncognates (e.g. 'hill' vs. 'brae'). We found symmetrical switch costs in both active and passive users, which were larger for non-cognates than for cognates. In contrast, non-users displayed significant asymmetrical switch costs thus resembling the pattern of results found for non-balanced bilinguals (Costa & Santesteban, 2004). These findings highlight the importance of considering use of different linguistic varieties within monolinguals when theorizing about what demands language use may impose on executive functioning.

Oral Presentation

Selective tuning of cognitive control brain areas during instructed task preparation

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How the brain uses relevant information to prepare for forthcoming events has been largely discussed in the last years. Studies in which participants had to switch between two different tasks reveal the interplay of both generic and category-specific brain circuits upon the presentation of an instruction cue, seconds before the appearance of its associated target. However, the brain mechanisms involved in preparation for newly instructed tasks are not well understood yet. In this study, we used univariate and multivariate analyses of fMRI data to assess which areas are involved in the implementation of tasks new to participants. We devised a paradigm in which 22 participants received novel instructions about what to do with an upcoming target, conformed by 4 faces and 4 letters. Half of the instructions pointed to face features and half to letters. Despite there were no behavioral differences between factors (all $Fs < 1$), univariate results revealed the preactivation of control areas such as the Inferior Frontal Junction (IFJ), Superior Parietal Lobe (SPL), BA10 cortex or Anterior Cingulate Cortex in new instruction trials, but failed to find differences between stimulus categories before the presentation of a target. Multivariate searchlight analyses, however, detected distinct patterns for new instructions categories in the hippocampus (59% decoding accuracy), IFJ (61%), cerebellum (63%) and SPL (63.5%), suggesting that these brain areas encode category-specific information to resolve incoming demands in new situations. Moreover, the decoding accuracy in the hippocampus was negatively correlated with RTs but only when performing novel tasks ($r = -.43$, $p < .05$), revealing that successful encoding of categories during preparation has a direct influence on behavior. Our results provide insights about how the brain implements new tasks by showing that specific information about an upcoming new behavioral requirement is encoded in high-level cognition areas, such as hippocampus and IFJ.

Oral Presentation

14:20 – 14:40 | Lara A - B

Evaluative priming reveals dissociable effects of cognitive vs. physiological anxiety on action monitoring

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Performance monitoring enables the rapid detection of mismatches between goals or intentions and actions, as well as subsequent behavioral adjustment by means of enhanced attention control. These processes are not encapsulated, but they are readily influenced by affective or motivational variables, including negative affect. Here we tested the prediction that worry, the cognitive component of anxiety, and arousal, its physiological counterpart, can each influence specific processes during performance monitoring. Participants were asked to discriminate the valence of emotional words that were preceded by either correct (good) or incorrect (bad) actions, serving as primes in a standard evaluative priming procedure. Results showed that worry, but not arousal, blurred the rapid and automatic processing of actions as good or bad. By contrast, arousal, but not worry, increased post-error slowing. Effects of worry on action monitoring were trait but not state dependent, and only evidenced when actions were directly used a primes. These results suggest a double dissociation between worry and arousal during performance monitoring: while worry interferes with the rapid and automatic affective tagging (along a genuine valence dimension) of self-generated actions, arousal increases post-error attentional processes.

Oral Presentation

Attentional bias toward threat: The role of exposure time and fear-relevance of the stimuli

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Attentional bias toward threat is considered to consist of three components. The first component assumes that attention is automatically attracted by threat (facilitation). The second component implies that attention is captured by threat and efforts are necessary to move attention away (difficulty to disengage). The third controlled component consists in avoiding allocation of attention to the threat (Cisler & Koster, 2010). Most studies found evidence for difficulty to disengage, but less evidence for facilitation or avoidance. In a dot-probe task we presented a threatening and a neutral picture or two neutral pictures for 200, 500 or 2000 ms. Then participants were asked to detect a dot appearing at one of the picture locations. Pictures of spiders, snakes, other threatening animals and non-threatening animals were used. Two groups of participants had selfreported fear of specific animals (Snake Group, Spider Group) and one group reported no specific fear (Control Group). Attentional bias was only found in the Spider Group for spiders and in the Snake Group for snakes. In the Spider Group, at 200 ms the dot was detected faster at the spider location, at 500 ms detection was delayed if the dot replaced the neutral picture indicating difficulty to disengage from threat, and at 2000 ms delayed detection at the spider location indicated avoidance. For the Snake Group, evidence for difficulty to disengage was found at all presentation times, but not for facilitation or avoidance. Our results support the idea of a quick and automatic mechanism directing attention to threat, followed by slower control mechanisms moving attention away from threat. However, this only applies if the threatening stimuli are fear relevant to the participants (Spider Group) and depends on the time of exposure to the threat. Differences between snakes and spiders might be due to different experience with both animal groups.

Oral Presentation

Shocking actions: Motivational consequences of anticipated electric shocks

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Several experiments examined motivational effects of anticipated electric shocks on action selection. Results showed that the anticipation of a shock facilitated selection of a response producing the shock relative to a response producing no shock. These findings show that emotional response suppression is not unconditional but depends on the task setting.

Oral Presentation

15:20 – 15:40 | Lara A - B

The role of emotion in processing and acquisition of abstract concepts

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Mastering abstract concepts like 'freedom' and 'culture' is critical to social and scholastic achievement, yet there is considerable theoretical debate about the linguistic and cognitive skills that underpin their acquisition. It is generally assumed that abstract concepts are linguistically coded, in line with imaging evidence of greater engagement of the left perisylvian language network for abstract than concrete words. Our work, however, shows that abstract concepts statistically tend to have more emotional associations than concrete concepts, and that once other factors (especially imageability) are controlled or parametrically examined, abstract word processing engage areas, such as rostral ACC, part of emotional processing system. Here we consider the role of emotional valence as providing a bootstrapping mechanism for the acquisition of abstract concepts at early stages of development. Words that denote emotional states, moods or feelings could provide examples of how a word may refer to an entity that is not externally observable but refers to internal states. We will present data from typically and atypically developing (ASD and SLI) children aged 5-12 to test this hypothesis. First, we analyse corpus data to demonstrate that abstract words have a privileged link to emotion and reliably predict age of acquisition norms for abstract concepts. Then, in a series of experiments, we provide empirical evidence detailing the development of abstract concepts using a lexical decision paradigm in TD, ASD and SLI children. Findings provide first evidence that young, school-aged children are sensitive to the emotional valence of abstract words and that this facilitates acquisition of abstract concepts.

Oral Presentation

Intentional control and attentional/working memory resources in evaluative conditioning

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Evaluative conditioning (EC) is a change in the evaluation of a conditioned stimulus (CS) that can be attributed to its pairing with an affectively laden unconditioned stimulus (US). Although initially EC was considered an automatic learning process, this view was recently challenged by research showing that EC shares various features of non-automatic processes. In this context we investigated two aspects of automaticity. First, we checked whether the acquisition of evaluative responses can be intentionally controlled by asking participants either to promote or prevent the possible influence of the US on the evaluation of the CS paired with it. This intentional control manipulation was applied either before or after acquisition of conditioned responses. Second, we studied if the availability of working memory resources moderate EC by applying a secondary auditory task during acquisition phase. The results show that control instructions to promote/prevent the impact of affective stimulus on the evaluation of paired neutral stimulus increase/decrease EC effect. However, the impact of control instructions was attenuated under working memory load. Also, the data show the impact of attentional load on direct measures of EC. Moreover, EC effect did not depend on participants memory for particular CS-US pairings. These results speak to the debate between associative and propositional accounts of EC suggesting that EC operates fairly independently of working memory resources (as proposed by associative account), but still can be intentionally controlled (as implied by propositional theory). We argue that dual-process account can best accommodate these results and discuss possible implications of dual-process theory of EC.

Oral Presentation

Debiasing the illusion of causality: The foreign-language effect improves accuracy in the detection of null contingency

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Previous studies have demonstrated that people are more rational and less biased when they are required to make decisions in a foreign language. The main purpose of the present study is to investigate the foreignlanguage effect in a causal learning task that usually induces people to develop an illusory perception of causality. We predict that the foreign-language effect can improve accuracy in the detection of null contingency and, therefore, be a factor to debias illusory perceptions of causality. In order to test this hypothesis, we conducted two experiments. In Experiment 1, eighty native Spanish speakers, highly proficient in English, volunteered for the study. Participants were assigned to one of four experimental groups (non-contingent/native tongue, non-contingent/foreign language, contingent/native tongue, or contingent/foreign language). They performed a standard contingency learning task, which can be used to detect illusions of causality. In the non-contingent conditions the outcome and its potential cause are independent events. Thus, any judgment about their causal relationship that differs significantly from zero can be taken as evidence of a cause-effect bias. In Experiment 2, thirty-six English native speakers, highly proficient in Spanish, participated in the study. They performed the non-contingent experimental conditions that we used in Experiment 1, one group in their native tongue, the other one in the foreign language. Overall, the results showed statistical differences as a function of language in the causality perceived between the two events for the non-contingent conditions in both Spanish and English speakers. Specifically, participants that performed the task in their foreign language judged the causal relationship in a more accurate way than those participants who performed the task in their native tongue. Our results provide further evidence in favor of the foreign-language effect: the illusion of causality, like other heuristic biases, can be reduced by presenting the problem in a foreign tongue.

Oral Presentation

14:40 – 15:00 | Amoroza A

The role of accent in the organization of the mental lexicon

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In the present studies we aim at exploring whether accent plays any role in the organization of the mental lexicon. To address this issue, we used semantic priming and the Deese-Roediger-McDermott (DRM) paradigms. Semantic priming has been used as a tool to understand the organization of the mental lexicon: The activation of some semantic features of the primes ('doctor') facilitates the processing of semantically related targets ('nurse'). This effect is commonly observed in the N400 ERP, which amplitude is more negative for unrelated ('bread') than for semantically related ('nurse') targets (Bentin, McCarthy, & Wood, 1995). In Experiment 1, 23 participants were presented with auditory primes (e.g., 'airport') uttered either by a native or a foreign-accented speaker. After the primes, written targets appeared on the screen: (1) Same word ('airport'); (2) Semantically related ('plane'); (3) Unrelated ('box'); or (4) Non-words ('brocho'). Participants were enrolled in a lexical decision task, and ERPs were recorded for the targets. We observed that during the N400 time window, the semantic priming effect [the difference between unrelated and semantically related targets] was much larger after the presentation of a native spoken prime, as compared to a foreign-accented prime. In Experiment 2 we used the DRM paradigm (Roediger & McDermott, 1995), a procedure used to study false memories. 27 participants were presented with lists of words regarding different semantic categories, spoken either by a native or a foreign-accented speaker. We observed that the lists of words presented with a native accent (as compared to the foreign accent) elicited a higher number of false memories within the semantic category in a posterior written recognition test. The present results suggest that accent plays an important role in the organization of the mental lexicon, serving as a crucial cue to retrieve words from long-term memory during speech comprehension.

Oral Presentation

Does the magnitude of semantic priming differ for monolingual and bilinguals? Evidence from adult Russian-English speakers

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Semantic priming has been the topic of much psycholinguistic research in the past 40 years and has been demonstrated to be an inherent entity of the cognitive system in which semantically related items (doctornurse) are processed faster and more accurately than semantically unrelated items (doctor-butter) [see Neely (1977) and Hutchison (2003) for reviews]. Although much attention has been paid in understanding semantic priming in monolinguals and bilinguals, this is the first report to examine a) whether and b) the extent to which bilingualism would modify semantic priming effect. The aim of the current study was to examine the effect of L2 (English) on the magnitude of semantic priming on L1 (Russian) in a naming task by comparing RTs in monolingual and bilingual adult Russian speakers. In Experiment 1, a total of 20 monolingual native Russian speaking university students were asked to name related and unrelated targets in a list consisting of 21 semantically related pairs [врач (doctor)-медсестра (nurse)] and [собака (dog)-кошка (cat)] and 21 unrelated pairs [врач (doctor) – кошка(cat)] using SuperLab. As predicted, the findings showed a significant semantic priming effect. In Experiment 2, a total of 20 bilingual Russian-English speaking university students were asked to name targets presented in the same language as the prime. The list for bilinguals contained 84 trials, including 21 semantically related pairs ("doctor-nurse," "dog-cat") in Russian [врач (doctor)-медсестра (nurse)] and 21 semantically related pairs in English; 21 unrelated pairs formed by re-pairing the stimuli in the related cases (e.g., "doctor-cat", "dog-nurse") in Russian [врач (doctor) – кошка (cat)] and 21 unrelated similar pairs in English.

Oral Presentation

The time course of structural resilience across languages: The case of online translation

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Following the finding of structural priming (e.g. Bock, 1986; Pickering & Branigan, 1998), reaction time has variously been reported as an alternative measure of priming in monolingual studies (e.g. Smith & Wheeldon, 2001; Corley & Scheepers, 2002; Segaert & al., 2011), but not yet in studies of comparable cross-linguistic phenomena (e.g. Loebell & Bock, 2003; Schoonbaert & al., 2008) or translation (Maier, 2009; Maier, Pickering & Hartsuiker, submitted). This paper presents results from studies that elicited both construction choice data and accompanying responce latency data in the course of spontaneous on-line translations of German ditransitive clauses into English. Results show a structural resilience of source constructions that is accompanied by a facilitatory effect only when the source language is L1. Findings are discussed with particular consideration of lexical frequencies and the various constructions involved, and put in relation to the construction-specific view of syntactic priming proposed by Segaert et al. (2011).

Oral Presentation

Language switching – but not foreign language use per se – reduces the framing effect

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Recent studies reported reductions of well-established biases in decision making under risk, such as the framing effect, during foreign language (FL) use. These modulations were attributed to the use of FL itself, which putatively entails an increase in emotional distance. A reduced framing effect in this setting, however, might also result from enhanced cognitive control associated with language-switching in mixed-language contexts, an account that has not been tested yet. Here we assess predictions of the two accounts in two experiments with over 1400 participants. In Experiment 1, we tested a central prediction of the emotional distance account, namely that the framing effect would be reduced at low, but not high, FL proficiency levels. We found a strong framing effect in the native language, and surprisingly also in the foreign language, independently of proficiency. In Experiment 2, we orthogonally manipulated foreign language use and language switching to concurrently test the validity of both accounts. As in Experiment 1, foreign language use per se had no effect on framing. Crucially, the framing effect was reduced following a language switch. Thus, our results suggest that reduced framing effects are not mediated by increased emotional distance in a foreign language, but by transient enhancement of cognitive control, putting the interplay of bilingualism and decision making in a new light.

Oral Presentation

14:20 – 14:40 | Amoroza B - C

Speed of Processing: Speed or processing?

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This study examined (a) the universality of processing speed as an intelligence measure across three different cultures, namely, Canadian, Chinese, and Greek, and (b) if speed of processing can be categorized under different types of information, representing major cognitive processes in early adulthood. 320 university students from Canada (n=110), China (n=105), and Cyprus (n=95) each were administered the Das-Naglieri Cognitive Assessment System (Naglieri & Das, 1997), including two tasks from each of the Planning, Attention, Simultaneous, and Successive cognitive processing scales, representing the individual's cognitive functioning. We applied (a) an advanced technique within structural equation modeling, that of factorial invariance, and (b) the nested factor modeling approach (Gustafsson & Balke, 1993; Papadopoulos et al., 2012) to analyze the data. This analysis can provide strong support for the consistency of the latent constructs across different tasks and across cultures. Three nested models were tested, a full, a general processing, and a processing speed model. The full model was parametarized to allow simultaneous indications of (a) the four PASS cognitive factors and (b) the processing speed factor, in order to examine whether the full model would account for the inter-subtests covariation of the cognitive abilities better than the general processing and processing speed factor models. The general processing and processing models, in turn, examined general speed against specific speed components dictated by the four PASS cognitive processes. Results showed that the model representing intelligence as a general processing rather than processing speed construct is the most parsimonious model with the loadings of the obtained factors being invariant across cultural groups. The study concludes that consistent with the theoretical predictions of the PASS theory, latent general processing provides a more complete picture than latent processing speed as a measure of the type of cognitive processing required in the assessment of intelligence across cultures.

Oral Presentation   **14:40 – 15:00 | Amoroza B - C**

Deficits in social information processing in children with Neurofibromatosis Type 1 (NF1) reflect problems with inductive reasoning

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Social information processing difficulties in the visual domain have been reported in children with Neurofibromatosis type 1 (NF1), and were partly attributed to deficits in cognitive control. The aim of this study was to unravel the role of ADHD symptomatology and inductive reasoning in deficits in social cognition, and to explore the auditory modality as well. Twenty children with NF1 (17 males; age range 5-13y) and 20 comparison children (14 males; age range 5-13y) completed (i) a facial expression recognition task on face drawings, (ii) a task where they were required to match such face drawings to the emotion expressed by a cartoon character shown in scenes of social interactions, and (iii) a task where they had to match such face drawings to the emotion expressed by two persons in short dialogues. Children with NF1 performed globally less accurately than comparison children in all three tasks. When ADHD symptomatology (i.e., the number of symptoms checked in the DSM-V list and the ADHD index of the Conner's Rating scale) was introduced to the analyses, the pattern of results did not change. But the difference between children with NF1 and comparison children disappeared when inducting reasoning (i.e., the score in the Raven's Colored Matrices) was introduced to the analyses. Multiple regression analyses confirmed this finding for all three tasks. Problems encountered by children with NF1 in social cognition appear to be caused by difficulties in inductive reasoning rather that by specific disorders of emotion information processing.

Oral Presentation

Attention Functioning Among Adolescents With Multiple Learning, Attentional, Behavioral, and Emotional Difficulties

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Attention-deficit/hyperactivity disorder (ADHD) is characterized by high levels of inattention, hyperactivity, and impulsivity; however, these symptoms can result from a variety of reasons. To obtain a comprehensive understanding of the various difficulties of individuals with ADHD, especially when co-occurrence difficulties are present, it is essential to combine neuropsychological and subjective assessment tools. In the present field study the authors investigated a group of adolescents with multiple deficits (MD) using neuropsychological and subjective measures. Teachers' ratings verified extremely high levels of symptoms of oppositional behavior, inattention, hyperactivity-impulsivity, social problems, and emotional problems in this group. As expected, MD group participants showed decreased abilities to maintain attention on task for a long period of time, focus attention and effectively inhibit adjacent distractors, and resist conflicting irrelevant information. Importantly, although significant differences in the attention measures were observed at the group level, not all MD participants displayed deviant performance. Thus, we conclude that the heterogeneous group of adolescents with MD comprises individuals with primary attention deficits as well as those with other nonattentional deficits that show equivalent behavioral symptoms. Using neuropsychological tools can be useful in differentiating between different core deficits and in guiding appropriate interventions.

Oral Presentation

15:20 – 15:40 | Amoroza B - C

Influence of anxiety on working memory and episodic memory in stroke patients without severe cognitive deficits

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The aim of this study is to see how the influence of anxiety on verbal and visual working memory and episodic memory of patients with acute stroke compared to matched healthy subjects may depend on the anxiety types (worry and anxious arousal) and the hemispheric lateralisation of the lesions. It is also meant to determine the impact of anxiety on the executive components of the working memory (updating, inhibition and shifting) in the acute and chronic phases of stroke, taking also into account socio-demographic (age, sex and educational level) and lesional (cerebral atrophy and leukoaraiosis) variables. These issues have not been previously considered and seem essential in a context where anxiety and working memory and episodic memory deficits are common after a stroke. 104 first-ever acute stroke patients and 104 matched healthy controls were included. An induction procedure of a state of anxiety characterized by alternating Stroop with interference (with time pressure and error feedback) and 1-back tasks with video recording and an evaluation of cognitive processes which are sensitive to anxious states (updating, inhibition, shifting, verbal and visual episodic memory) have been made. We have shown that anxiety was contaminating the verbal and visuospatial working memory and the verbal episodic memory performance in the patients with acute stroke, particularly in the patients with left hemispheric lesions compared with patients with right hemispheric lesions and control subjects. We have also shown that anxiety contributed to the poorer performance of updating, inhibition and shifting in acute phase of stroke and of updating in chronic phase while no effect was observed in control subjects. Attention to the stressful character of some neuropsychological tests (e.g., Stroop) and the impact of anxiety on working memory and episodic memory emphasizes the importance of a clinical rehabilitation of the patient cognitive deficits, potentially contaminated by anxiety.

Oral Presentation

15:40 – 16:00 | Amoroza B - C

Attention processes underlying a brain computer interface task are influenced by amyotrophic lateral sclerosis

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Brain-computer interfaces (BCIs) translate brain activity into control signals for external devices. The P3 eventrelated potential (ERP) is usually exploited in BCIs (P3based-BCI) that might replace communication in people with severe motor disability. However several studies with P3based-BCIs conducted with people with amyotrophic lateral sclerosis (ALS) showed a large inter-individual performance variability. The present study aimed at clarifying if and how the ALS disease affects the capacity to accomplish a P3based-BCI task (e.g. P3-speller) and the attentional processes linked to the P3. Thirteen volunteers with ALS (8 males; age 62.2 }13) and a matched-group of 13 healthy volunteers (9 males; age 55.3 }9) took part in the study. Both the groups performed a P3-speller task, a rapid serial visual presentation task (RSVP) and a change detection task (CD). Statistical analysis aimed at i) comparing the two groups in terms of BCI accuracy and in terms of amplitude and latency of N2 and P3 ERPs elicited during the BCI task, ii) investigating if attentive and working memory subprocesses (respectively screened with RSVP and CD) were predictors of the BCI control and iii) comparing the two groups in terms of such cognitive processes. Results showed that i) participants with ALS had lower accuracy in P3-speller control (p<.05) and longer P3 latency (p<.05), ii) the capacity to temporally filter a target stimulus within a stream of stimuli (T1 accuracy in RSVP) was a predictor of the P3-speller control (p<.05) and iii) the capacity to temporally filter a target stimulus was compromised in participants with ALS (p=.01). We speculated that ALS disease affects the capacity to accomplish a P3based-BCI task by delaying the allocation of attentional resources in the post-perceptual stage of stimulus processing (P3 latency) and by decreasing the capacity to temporally filter a stimulus which resulted a predictor of BCI control.

Oral Presentation

The hazard fallacy

14:20 – 14:40 | Amoroza D

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The hazard function describes the development of the conditional probability that a target stimulus will occur at a given moment after a temporal cue, given that it has not yet occurred. Hazard has played a crucial role as an explanatory construct in the timing literature especially because it shows excellent correlations with performance measures. However, in this presentation we point out a profound limitation of this construct: It is unclear how humans (and other animals), when involved in any particular timing task, acquire knowledge of the hazard function and how they use this knowledge to their advantage. We proceed by presenting the outlines of an alternative theory, which assumes that timing is driven by memory traces of earlier timing experiences. We then show how this theory accounts for classic reaction time effects in the variable-foreperiod paradigm, where the hazard function has been particularly dominant. Finally, we present the data of some initial experiments that support the view that timing is driven by past timing experiences rather than by current hazard.

Oral Presentation

Effects and aftereffects of rule violations

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Most of our daily life is organized around rules and norms, and social life depends on the adherence to such rules in the majority of cases. But it happens that humans intentionally violate rules. To discuss the behavioral parameters of rule violations, we conducted a series of experiments on an iPad, which allowed us to track the participants' finger-movements on the touchscreen, when adhering or violating a rule, inverting a rule, or switching between rules. Our experiments show that rule-violation behavior is distinctly different from rulebased actions in both, response times and movement trajectories. Moreover, the results revealed distinct aftereffects of rule-violations as compared to rule adherence or switching between rules.. We consider the study as a first step towards revealing and understanding the signature of non-conformity.

Oral Presentation

Oral Presentation   15:00 – 15:20 | Amoroza D

Counterfactual and semifactual alternatives in moral judgments about failed attempts to harm

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We examine moral judgments of blame, punishment and wrongness for failed attempts to harm, for example Jenny attempts to burn her partner's hand, but her partner happens to move and the attempt to burn her fails. The first experiment shows that participants blame and punish more for a failed attempt to harm compared to a failed attempt to harm that results in harm by another cause, even when their judgments focus on the specific attempt to harm rather than the outcome. The second experiment shows that participants judge an individual more deserving of blame, punishment and more wrong for a failed attempt to harm when they are primed by a counterfactual alternative where the intended harm occurred rather than by a semifactual alternative in which the intended harm did not occur. This effect occurred regardless of whether the intended harm was worse than the actual outcome or not. The third experiment shows that participants judge an individual more deserving of blame, punishment and more wrong when they are primed by a counterfactual than a semifactual alternative not only for failed attempts to harm but also for accidental near misses. Implications for the cognitive processes underlying judgments of failed attempts are discussed.

Oral Presentation   15:00 – 15:20 | Amoroza D

Oral Presentation

15:20 – 15:40 | Amoroza D

Second-order false-belief: a modal analysis

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Influenced by the pioneering work of Michiel van Lambalgen and Keith Stenning, a number of researchers are applying logical modelling to problems from cognitive psychology. Our work on Theory of Mind belongs to this tradition, and is distinguished by (1) the use of modal logic, which allows simple formalization of perspectiveshifting and (2) a focus on second-order false belief. In second-order false-belief tasks, agents have different conceptions of the world, and modal logic gives rise to straightforward and natural formalizations of the reasoning involved. We are currently using our modal analysis to guide the design of a training experiment on the second-order false-belief abilities of autistic children. So far, modal logic is proving important in several ways. Two seem particularly relevant to our experimental design: 1. We use modal logic to analyze the JDV language test, developed by Elisabeth Engberg-Pedersen and Ditte Boeg Thomsen, linguists at University of Copenhagen. This test measures mastery of three Danish discourse particles ('jo', 'da' and 'vel'), requiring perspective-shifting ability. We expect our analysis of the test - what kind of reasoning gives rise to correct answers, and where does it go wrong when incorrect answers are given - to yield predictions concerning training-based enhancement of second-order false-belief skills. 2. Logical analysis can sometimes reveal why two similar-seeming reasoning tests give rise to different empirical results. For example, the Sally-Anne task turns out to depend on an 'inertia principle' that is not required in the Smarties task, even though both tasks are typically taken simply to indicate false-belief understanding. We would like to lift this observation to the second-order level: can logical analyses of wellknown second-order false-belief tasks disclose similar differences? And can such differences be explicated via Piagetian conservation principle?

Oral Presentation

15:40 – 16:00 | Amoroza D

Semantic Search in the Remote Associates Test

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Searching through semantic memory may involve the use of several retrieval cues. In the remote associates task (RAT), three cues are presented and a single target word has to be found. Whereas the task has been widely studied as a task of creativity or insight problem solving, here I treat the RAT as a semantic retrieval task and assess it from the perspective of information foraging theory. Three experiments are presented that address the superadditive combination of cues and the search behaviour when people solve the RAT. Experiment 1 shows that people are able decide on the solvability of a triplet by using global activation. Experiment 2 reveals a new type of search strategy that leads to an anti-clustering behaviour in the recall sequence. This search behaviour is further tested in the third experiment which finds that search behaviour depends on the solvability of the triplets. A computational model is presented that implements the search behaviour and allows for assessing whether it is optimal given the task.

Oral Presentation

15:40 – 16:00 | Amoroza D

Poster Presentation

Stimulus-response links and the backward crosstalk effect – A comparison of forced- and free-choice tasks

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In dual-tasks, (spatial) incompatibility of Task 1 and 2 responses slows down reaction time even in Task 1. This is called the backward crosstalk effect (BCE). To account for the BCE, Hommel (1998, JEPHPP) suggested that the appearance of the Task 2 stimulus automatically projects activation onto the corresponding response through (transient or direct) stimulus-response (S-R) links. One way to investigate this claim is to test for a BCE when Task 2 involves no S-R links. One such class of tasks are free-choice tasks. In two experiments, Task 2 was always a forced-choice task, but Task 1 was either forced-choice or free-choice. For forced-choice trials a larger BCE occurred than for free-choice trials. This suggests that S-R links are indeed involved in the BCE, and that they transmit automatic activation from stimuli to corresponding responses. Explanations for the residual BCE in free-choice trials are discussed.

Poster Presentation   **Session C**

Look at her, and she will notice you: Direct gaze breaks through to consciousness faster than averted gaze in change detection

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Studies of conscious and non-conscious perception have paid surprisingly little attention to how observers become conscious of initially implicitly presented stimuli. Most effectively, this can be studied with continuous flash suppression or change blindness. Both offer a way to study whether some type of a stimulus enjoys a privileged status in consciousness over others. One example of this is direct gaze. In the continuous flash suppression (CFS) paradigm, in which conscious perception of a stimulus is suppressed by presentation of a flashing high-contrast stimulus to the other eye, direct gaze is preferred so that it breaks through to consciousness faster than averted gaze.   The present studies aimed to investigate whether this holds for change detection in the change blindness paradigm. In change blindness, immediate consciousness of changes is prevented by a mask inserted before the presentation of the changes. Either changes can be detected by random top-down search, or they can trigger implicit attentional shifts resulting in breaking through to visual consciousness.   In three experiments, changes were presented in a S1-S2 change blindness paradigm. Four facial images with laterally averted or direct gaze, the composition of which was varied across the experiments, were presented around a fixation cross. Occasionally, the gaze of one face changed from averted to a direct gaze or vice versa. We found that changes from averted to direct gaze were detected more efficiently than changes from direct to averted gaze. This held for all distractor face compositions. However, when observer gender was controlled, the results showed that this effect was confined to female participants in all three experiments. This suggests that among faces, those offering a possibility to eye contact enjoy a privileged status in consciousness, at least for women.

Poster Presentation

A model of driver's visual distraction

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Nowadays, one of the most challenging issues faced by Advanced Driving Assistance Systems (ADAS) is how to "adapt" to the current context in order to safely support the driver, i.e., how to properly react to changes in the internal and external conditions. On this respect, the driver's psychological state is considered a relevant context aspect to be taken into account. In this study, we present a model of the driver's visual distraction that can be exploited for designing the adaptation behavior of an ADAS. The model has been developed by leveraging ecological data collected through an in-vehicle experimental campaign. Thirty participants have volunteered in the experiment. Participants have been driving on a test site including a highway part and a extra-urban part. The distraction has been induced by an interfering task consisting in a visual search performed on a secondary touch screen (Surrogate Reference Task (SURT)). The distraction task resembles the interaction of the driver with a real touch screen device on the car dashboard. By means of a proper vehicle equipment configuration (internal camera, vehicle CAN bus and secondary task), we have been able to collect data about the driving behavior (like the steering angle, vehicle speed, position of the vehicle in the lane, etc.), the driver's head orientation, and the execution of the secondary task (e.g., response times, correct answers, etc.). We have analyzed the data in order to compare the driving behavior with and without the SURT in the different road scenarios. The analysis results show that the distraction task significantly affects the driving performance in both scenarios. We have exploited such results to derive the model of the driver's visual distraction based on vehicle dynamics.

Poster Presentation

Motivational factors of electrodermal activity during Stroop-performance

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Electrodermal activity (EDA) is triggered by dynamical changes of the autonomic nervous system. EDA measures reflect psychological states and processes, especially ones related to emotion, arousal, and attention. Findings suggest a negative association between inhibitory processes and electrodermal activity. The Stroop task measures executive attention. While inducing conflicting response tendencies, participants are typically asked to inhibit the "well practiced" response and execute the subdominant response. Others assessed electrodermal complexity during the Stroop Color Word Test using nonconflicting and conflicting Stroop task performance data from 106 students. They reported that color–word interference was not reflected in EDA responses. In the present study EDA and Stroop performance measures were collected from 188 university students. Nonconflicting and conflicting (e.g. red written with blue ink) stimuli were intermixed, subjects were asked to identify color of the words in both conditions. Baseline condition was followed by a motivated condition, where a small gift was promised for those who perform better as compared to their own mean reaction time performance in the baseline condition. Feedback about correctness of answers as well as their winning chances after each response was provided ("Great, you will probably win!" or "Watch out, you might lose!"). EDA after correct and erroneous responses to the different stimuli types were analyzed in both conditions. Results indicate an elevated EDA for conflicting stimuli, but only in the motivated condition. Electrodermal activity was also significantly higher when subjects responded with incorrect answers, or when they saw the warning sign endangering their winning chances. We believe that the experimental conditions and methodology applied was essential in the demonstration of EDA changes related to the Stroop effect. To our knowledge, this is the first significant report on elevated EDA for conflicting stimuli.

Poster Presentation

Spatial Working memory is enhanced by the differential outcome procedure in a group of participants with Alzheimer's dementia

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Alzheimer type dementia (AD) is one of the most common neurodegenerative disorders associated with aging. Memory is one of the first cognitive processes to deteriorate in this condition. In the present study we employed the differential outcomes procedure (DOP) to improve visuospatial memory in a group of participants with AD. The DOP involves a conditional discriminative learning task in which a correct choice response to a specific stimulus-stimulus association is reinforced with a particular reinforcer or outcome. A group of 12 participants with AD, and a matched control group had to learn and keep in working memory four target locations out of eight possible locations where a square could be illuminated. The overall performance of AD participants was very poor (below chance) as compared to matched control group (70% accuracy), which shows that the task was highly demanding for the group of patients. More importantly, AD participants exhibited improved terminal accuracy that was statistically significant, when a unique outcome was paired with a location (60% accuracy) as compared to a non differential outcome condition (37%) in the short delay. Participants in the control group also showed a benefit (to a lesser extend) from the differential outcome condition. This finding suggests that the DOP is useful in improving visuospatial working memory in AD patients.

Poster Presentation

Attenuation of control in the numerical and physical Stroop tasks

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In numerical Stroop tasks, participants are asked to compare the physical sizes (a physical task) or numerical values (a numerical task) of two digits and ignore the irrelevant dimension (Henik & Tzelgov, 1982). The participants are unable to ignore the irrelevant dimension and a congruency effect emerges. The literature suggests that there is asymmetry in the ability to exert control in the physical and numerical tasks. The present study examined this assumption by manipulating the proportion of neutral trials in an experimental block. Our findings suggest that increasing the proportion of neutral trials attenuates control. Attenuation of control was manifested in both the physical and numerical tasks. Moreover, it seems that the asymmetry between the tasks is subtle and evident in conflict conditions.

Poster Presentation

Cognitive factors causing memory distortion vulnerability

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Cognitive psychology has assembled a massive amount of data leading to clear conclusion that people show tendency to create false memories. Despite many years of research, crucial question about factors indicating individual's vulnerability to a memory distortion still remains unanswered. To shed some light on this problem, two experiments were conducted, both using DRM paradigm (Deese 1959, Roediger & McDermott, 1995) and modified version of "remember-know judgment" procedure (Tulving, 1985). The aim of first study (N=61) was to verify whether false semantic memories, created by participants in DRM procedure, are being memorized in a way similar to the real ones, so the establishment of the episodic structure of false memory could be supported. It is assumed that recollection of memories, both true and false, is provoked by increasing level of activation in a very specific part of the memory network. For recent studies it was essential to (1) determine, if similar effects appear regarding to false and real (episodic) memories and (2) ascertain the laboratory-created false remembrances behave similarly to accurate memories, instead of random mistakes. Results show that participants were willing to make "remember" judgments referred to true and false memories more often than to unrelated word, which were usually judged as "known". Moreover, medium level of properly recollected words (57%) was approximate to a medium level of false memories (52%) and there was no significant difference between these rates [t(60)=-1,87; p=0,066]. In order to check if there is an association between the number of false memories "remembered" by the participants and their cognitive abilities, (measured by a level of performance in standard memory and attention tasks) second experiment (N=102) was provided. The results indicated that high level of certainty and poor working memory capacity (Cowan, 2001; Engle, 2002) are the main cognitive risk factors of creating false memories.

Poster Presentation

Cognitive effects of a mindfulness training with fifth-graders

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Mindfulness is the nonjudgmental, accepting awareness of moment-by-moment experience (Bishop et al., 2004; Kabat-Zinn, 2005). Mindfulness-based interventions have proven to be effective for promoting wellbeing, mental and physical health (Brown & Ryan, 2003), but effects of mindfulness practice on cognition have received much less research effort. Although the limited number of studies in this area yielded promising results, the evidence so far is dampened by a predominantly data-driven approach and several methodological shortcomings. Furthermore, research has focused on adult populations, despite of children's higher neuronal and cognitive plasticity. The present study aimed at overcoming these limitations. Drawing on Bishop et al.'s (2004) operational definition of mindfulness, beneficial effects of a mindfulness intervention on the following cognitive abilities were predicted: sustained attention, cognitive flexibility, cognitive inhibition and data-driven as opposed to concept-driven information processing. 24 5th graders received either a mindfulness training (experimental group) or a concentration training (active control group) twice per week over a period of five months. In addition, 10 students that did not receive experimental treatment served as inactive control group. Immediately before and after the training period, participants' cognitive abilities were assessed by means of computer-based tests (vigilance test, interpretation of reversible figures, Wisconsin Card Sorting Test, Stroop test, visual search task, recognition of prototypical faces). The results indicate that mindfulness trainings with children specifically improve sustained attention, cognitive inhibition and data-driven information processing. A specific influence of mindfulness training on cognitive flexibility is not supported by the data. Possible underlying mechanisms are discussed.

Poster Presentation

Sequential modulation of modality congruency effects

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Previous studies indicated the importance of cognitive control for conflict resolution. The congruency effect and its sequential modulation serves as a means of assessing conflicts in cognitive control. However, conflicts were often investigated employing target and distractor stimuli within one modality. In our current study, we investigated sequential congruency effects in a setting of crossmodal stimulation using a cued modalityswitching paradigm. Participants (n=20) performed a numerical and a location judgment task in blocked order with bimodal stimulation (simultaneous auditory and visual stimuli). A cue indicated the target modality. In the numerical task, participants were asked for a numerical magnitude judgment about the presented number word ("two" or "eight") in the target modality in its relation to the fixed standard "five". In the location judgment task, participants were asked for a left/right judgment of the presented stimulus (visual or auditory stimuli presented at the left or right side) in the target modality. Importantly, the auditory and visual stimuli were either congruent or incongruent to each other. Results indicated smaller congruency effects (i.e. difference between congruent and incongruent trials) after an incongruent trial, which was further modulated by modality transition. Specifically, the reduced congruency effect was found for modality repetitions but not for modality switches. Finding that the sequential modulation of the congruency effect occurs only within the same modality suggests that conflict resolution is modality-specific.

Poster Presentation

The effect of pain stimuli predictability – pain perception and amplitude of P250-400 component

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Empirical works have shown that predictability of painful stimuli may modulate ERP amplitude and increase pain perception. Crossing hands over the body's midline impairs the ability to localize stimuli and decreases both the subjective sensation and amplitude of early ERP components elicited by tactile and pain sensations (Gallace et al. 2011). The first aim of the study was to determine if unpredictability of tactile and pain stimuli exaggerate the mean amplitude of P250-400 component and the perception of pain. The second aim was to determine if observed effect is reduced in crossed hand position. Participants (23 females) were informed about the intensity of the electrical stimuli and hands position (crossed or uncrossed) at the beginning of each of the 16 blocks of the experiment. In total 200 painful and 200 non-painful stimuli were delivered to the left/right hand. Arrows (cues) pointing right or left, preceded each of stimuli. In 80% of trials the arrows pointed the correct side of the stimuli appearance (predictability). EEG activity was recorded from 64 electrodes. Participants' task was to rate sensation after stimuli on Numerical Rating Scale (NRS). Results show that nociceptive stimulation evoked larger P250-400 amplitude and induced higher NRS score. The amplitude of P250-400 was exaggerated and participants scored their sensation as less painful when stimuli were delivered unpredictably to the opposite side of the body. Decrease in NRS pain ratings was observed only in uncrossed condition. Also the effect of the unpredictability of stimuli appearance was bigger in uncrossed condition. Our findings are contradictory to Gallace et al. (2011) which are related to differences in experimental design.

Poster Presentation

Session C

How a serially organised working memory affects timing processes

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Time, numbers and space share a dimension of magnitude, which has been argued to be processed in a common magnitude system, explaining commonly observed interactions between these three modalities (A Theory of Magnitude, Walsch, 2003). However, previous research already showed that a part of the interactions between number and space can actually be explained by mediating processes related to a serially organised verbal working memory (WM; De Belder et al., 2015; van Dijck et al., 2011). The link between serial position in verbal WM and time hasn't be explored yet. In the current study we conducted two time-related experiments while subjects were keeping information in working memory. In experiment 1 participants were instructed to respond to a letter turning from red to green, from which the time was varied. We observed that participants were faster with responding after short waiting times to a letter that was part of the beginning of the WM sequence, while relatively faster responding times were observed for letters from the end of WM after longer waiting times. These results illustrated a clear interaction between the perception of time and position in WM. The second experiment was designed to investigate whether these observations also extend to the production of time. Participants were instructed to reproduce the presentation time of a centrally presented dot, but only if the dot was followed by a WM item. Results demonstrated an interaction between the reproduction of time and position in WM. Overall, our results indicate that a serially organised WM can clearly affect the processing of time, not only observed in the perception, but also the production of time.

Poster Presentation

The efficiency of information processing in working memory, field dependence and susceptibility to orientation illusions

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This study examined cognitive predictors of susceptibility to orientation illusions: Poggendorff, Ponzo, Zollner and Rod-and-Frame illusion. It has been assumed that lower efficiency of information processing in working memory and field dependence tends to produce orientation illusions. 62 architects (30 women, 32 men) aged 29, +/- 0,5 were tested with the Witkin's EFT to determine field dependence, SWATT – was used as a measure of efficiency of working memory capacity, and susceptibility to visual illusions was verified with the series of computer tasks Visual Illusions Simulation (VIS). Using multiple regression, measures of working memory efficacy and field dependence-independence (FDI) were used to predict susceptibility to visual illusions. It appears that weak efficiency of working memory processing and field dependence are responsible for greater susceptibility to orientation illusions. Field-independent architects are the uniform group in terms of functioning of cognitive processes and have robust information processing abilities. This style is associated with activation of deeper level of information processing (top-down) including central executive functions. Efficient central executive functions seems to be key in the resistance to illusions.

Poster Presentation

Interactions between volitional emotional control and attention during visual perception

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Emotional regulation is the ability to modulate the intensity of responses to emotional stimuli. The reappraisal of the stimulus meaning influences the late positive potential (LPP) which can be considered as a marker of emotional processing. In the study we explored how additional task during reappraisal could interfere with these regulatory effects. 93 subjects were identifying a small, supraliminally presented letter against the standardized, emotional pictures (negative, neutral or scrambled images). Three attentional conditions were possible, signalized by a cue before each trial: identify the letter in expected location, identify the letter in unexpected location or ignore the letter. We assigned subjects to one of the two groups: the reappraisal (with instruction to reinterpret the images if they become unpleasant) or the control one. The LPP evoked by negative slides was decreased in the reappraisal group comparing to the control one. However, this attenuation of amplitude was similar irrespective of the picture type and affected also neutral and scrambled images. Observed lack of specificity of reappraisal may suggest involvement of more general, tonic attenuation of visual processing in this group. Furthermore, the conditions, where the attention was required to idenfied letters, were related to increased latency of the reappraisal effect (approx. 0.5s for the ignore condition, 2s for the unexpected and 2.5s for expected location). This interference shows that both tasks compete for cognitive resources and are possibly based on serial processing. As long as the voluntary attention is oriented towards concurrent stimuli, the regulatory effects are weakened. This study was supported by the National Science Centre under Grant DEC 2013/09/B/HS6/02662.

Poster Presentation

Attentional focusing and the exogenous cuing task

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The process of expanding or contracting our visual focusing is called attentional focusing. Classic experiments on attentional focusing showed that the size of the attentional focus can be adjusted to cover different area sizes in the visual field. We examined the relationship between Posner's exogenous cuing task (where the cue is not predictive of target location) and the focus of attention. We used a simple detection task and manipulated the cue size as well as the validity and the cue-target onset asynchrony (SOA). In the first experiment the results indicated that a small cue can enhance processing of a target, but only when there is a sufficient interval between the cue and the target (i.e., relatively long SOA). In the second experiment, we manipulated both the cue and target sizes orthogonally in order to investigate if the effect of the attentional focus was due to compatibility between cue size and target size. There was no cue-target compatibility effect and the results showed a cue size effect regardless of target size. Our results show that cue size modulates focusing even when cueing is exogenous.

Poster Presentation

When distractors have a positive effect on working memory performance

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For a decay model of working memory (WM) such as the TBRS model, memory traces suffer from time related decay as long as attention is occupied by the concurrent task. Fortunately, these traces can be reactivated by attentional refreshing as soon as attention is available (Barrouillet, Portrat, & Camos, 2011). In a complex span task where distractors and to-be-remembered items alternate at encoding, recall performance is thus function of the cognitive load (CL) (proportion of time during which the concurrent task occupies attention), but is not function of the number of distractors at constant CL. For interference models, forgetting in WM results from interference produced by the encoding of distractors that are superimposed over memory traces (Oberauer & Lewandowsky, 2008). According to this conception, the greater the number of the distractors, the higher the forgetting of memory items. However, in our view, an increase of the number of distractors could also have a positive effect on memory performance especially under low CL because such particular circumstances elicit more opportunities and time to consolidate memory traces. Using a complex span task, in which participants maintained six images for further recall while reading letters, we varied both the pace of presentation of the letters (high CL: 800ms, medium: 1600ms and low: 2400ms) as well as the number of letters (2, 4 and 8). The results revealed a classical effect of CL (high < medium < low). More interestingly, we observed a positive effect of the number of distractors (2 < 4 and 8) and this effect was exhibited only at low and medium CL's. These findings are consistent with an extra mechanism, akin to consolidation, that would be triggered after the classical refreshing process compensated the decay. Simulations of the computational model TBRS* give insights to this interpretation.

Poster Presentation

Inhibition of return is blind to task-irrelevant emotional content

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In a common exogenous cueing experiment, participants are presented with two peripheral boxes. After a nonpredictive exogenous cue (e.g., a brief brightening of a box), followed by a short interval (i.e., stimulus onset asynchrony – SOA), a target (e.g., an asterisk) appears inside either the cued (i.e., a valid trial) or the uncued box (i.e., an invalid trial). Typically, for long SOAs (e.g., 450 ms), reaction time (RT) is faster for non-cued vs. cued trials. This effect is widely known as inhibition of return (IOR). Some previous studies have shown a reduction or elimination of IOR when negative stimuli (e.g., angry faces) served as cues or targets. Nonetheless, other studies have shown no effect of emotion on IOR. The aim of the current study was to examine if and under what conditions task-irrelevant emotional content can modulate IOR. In our task, neutral and negative pictures appeared following cue offset and inside a central square, hence in a task-irrelevant location (i.e., where a target is not expected to appear). Targets appeared following either a short (450 ms) or long (900 ms) SOA. While IOR was observed for both SOAs, a valence effect—longer RTs following negative vs. neutral pictures—was apparent only for the short SOA. Nonetheless, no emotional modulation of IOR was found. In Experiment 2, we manipulated the processing depth of the pictures by asking participants to remember the pictures and perform a recognition test at the end of the session. IOR was again observed for both SOAs. A valence effect, reversed to that observed in Experiment 1, was apparent only for the long SOA. Although the participants successfully remembered the pictures, no emotional modulation of IOR was observed. We conclude that IOR is blind to task-irrelevant emotional content, regardless of processing depth, and hence constitutes a purely reflexive phenomenon.

Poster Presentation

Position bias in pupil-size measurement and isolating real and artifactual components: a methodological study

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The measured size of the pupil depends on the position of the eye. It is often assumed that this position bias is artifactual (i.e. due to movement of the eye relative to the camera, rather than real pupilsize changes), and can be corrected with linear regression. In this study we wanted to: estimate the size of the position bias; estimate whether or not this bias is linear; and distinguish real position-dependent changes in pupil size from artifactual changes. In a first experiment, we collected pupil size for several fixation points on the screen to test the strength and linearity of the position bias. In a second experiment, we isolated the artifactual component of the position bias. As we know, there is fast change in measured pupil size during a saccade. This change is too fast to be actual dilation or constriction of the pupil, and must therefore be artifactual. So we measured pupil size at the same location of the screen during prolonged fixation and right after a saccade. By comparing the two conditions, we isolated the artifactual component of the position bias in pupil-size measurements. Our preliminary results show a weak and roughly linear position bias. We further show that position-dependent changes in pupil size are partly real, and not purely artifactual as often assumed.

Poster Presentation

Filtering irrelevant feature information: A transcranial magnetic stimulation study investigating the role of the dorsolateral prefrontal cortex in feature based selection

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To effectively engage with our environment we need to be able to flexibly select information that is currently useful and ignore irrelevant details. We present a two-part study to examine feature-based selection and the role of the dorsolateral prefrontal cortex (dlPFC) in filtering irrelevant information. First, we developed a task that measures intrusion by irrelevant feature information based on the Garner interference paradigm (Garner, 1988). Participants performed a task on one feature dimension (e.g., colour) and ignored another (e.g., form) of novel objects. In separate blocks, subjects were asked whether the relevant dimension was the same or different as the previous object in a 1-back task. The irrelevant feature (form in colour blocks; colour in form blocks) was congruent or incongruent with the required response. Consistent with previous literature, we found a significant increase in error rates when the irrelevant feature response was incongruent as opposed to congruent with the relevant feature response. This gives us an effective measure of selection and filtering, with subjects being unable to completely suppress the irrelevant feature dimension. In the second stage of the study, we will use this paradigm combined with transcranial magnetic stimulation (TMS) to investigate the contribution of the dlPFC in filtering irrelevant feature information. This region has previously been defined as part of a network of regions referred to as multiple-demand (MD) regions that are believed to play a fundamental role in mechanisms of cognitive control (Duncan, 2010). We predict that disruption of dlPFC in comparison to control sites will selectively impair the ability to filter irrelevant information, increasing the magnitude of the filtering effect. This will contribute to our understanding of the role of the dlPFC in selective feature-based attention.

Poster Presentation

Translating experimental paradigms to the study of individual differences: The reliability of response control tasks

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The ability to control one's responses in the presence of conflicting information is core concept in psychology, linked to executive functioning, inhibition, and impulsivity. Many of the tasks used to assess response control, such as the Stroop and Eriksen flanker tasks, have a history in experimental psychology, in which individual differences are traditionally not the main focus. However, as response control becomes relevant for understanding psychopathologies, it is common to see such tasks translated to correlational research. This has led to some problematic findings in the literature, such as small or absent correlations between tasks assumed to measure the same construct. A crucial prerequisite for a measure to be effective in correlational research is that it reliably captures variance between individuals. However, despite the prominence of response control tasks, reliability information has been absent. Here, we present data from two test-retest reliability studies (total N=104) of four widely used response control tasks: the Eriksen Flanker task, the Stroop task, the stop-signal task, and the go/no-go task. Reliabilities varied substantially across the tasks. Further, low reliability was not consistently associated with high measurement error; instead low correlational reliability was associated with low variance between individuals - which of course is one reason such tasks have been popular for non-correlational experimental approaches. Based on our findings, we provide guidance for the use of these tasks in the study of individual differences, such as the minimum trial numbers and sample sizes required for adequate statistical power in behavioural and neuropsychological research.

Poster Presentation

Neural correlates of sustained attention and response inhibition among adults with and without attention deficit\hyperactivity disorder (ADHD)

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Deficiencies in sustained attention and response inhibition are of the most prominent deficiencies among adults with attention-deficit/hyperactivity disorder (ADHD). In the current studies we aimed to elicit functioning of these two mechanisms while recording EEG data and during fMRI scanning (on separate experiments), in order to trace neural correlates of the well documented neuropsychological differences between participants with ADHD and control participants. Participants performed a conjunctive continuous performance task (CCPT) with a manipulation of target frequency, measuring sustained attention and response inhibition in two task variants, thus allowing a direct comparison of these functions. ERPs and BOLD signal corresponding to the two task variants are contrasted within and between groups (participants with or without ADHD). The relations between the neural level (ERP measures / BOLD activations), the neuropsychological level (RT- and ACC-based measures), and the clinical level (self-reported ADHD symptoms) are investigated and their interpretations are discussed.

Poster Presentation

The effect of stimulus salience on movement planning and execution

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Attention progresses from the most to the least salient item in a given scene. The attentional effect of salience can be assessed through hand movement paradigms since attention and motor action share common mechanisms. Yet, little is known about the relation between those mechanisms, and especially about the influence of attention on different steps of movement elaboration. We investigated the salience-based progression of attention with a new approach by adapting the Multiple Salience Level Visual Search Task to a reaching paradigm. A visual search display containing three items of different sizes was presented on the corners of an imaginary equilateral triangle, fixation being at the centre of a screen. The size of the target was different at each new trial in order to assess its salience. Participants were asked either to reach toward a lateral bull-eye pad (Reaching), or only to release a response-button (Lifting) as a function of the orientation of the target. It was expected that performance would be influenced as a function of the size of the target compared to distractors (i.e., salience). Results confirmed this size effect: participants were faster when the target was the largest item, relative to the medium or the small target. Progression slopes computed on the total movement time showed that performance was more affected by size in the reaching condition relatively to the lifting condition. Results are in favour of i) the influence of the salience-based capture of attention on the elaboration of controlled movement, ii) the influence of this effect on both planning and execution of movement, and iii) a common spatial and motor mapping cortical system.

Poster Presentation   **Session C**

Comorbidity and age matters: Deficient response inhibition in Tourette Syndrome

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Tourette syndrome (TS) is a neurodevelopmental disorder linked to frontal-basal ganglia circuit dysfunction and characterized by motor and vocal tics. Previous investigations have found mixed support for the hypothesis that TS involves deficient inhibitory control of action impulses. In the present study, we examined the roles of comorbidity and age in accounting for inhibitory control deficits in TS. We tested 150 adolescents and young adults with TS and 46 controls who completed the SIMON task, which measures susceptibility to impulsive motor errors and the proficiency of inhibiting these impulses (Wylie et al., 2013). Then the TS group was divided into comorbidity subgroups: TS-only (58.0%), TS+ADHD (18.0%), TS+OCD (13.3%), TS+ADHD+OCD (10.7%). Further, age was investigated within the TS-only group by comparing adolescents and young adults. The entire sample of TS participants showed similar rates of impulsive motor errors and proficiency of inhibitory control, compared to controls. Analyses of comorbidity subgroups revealed that the presence of ADHD was associated with deficient inhibitory motor control compared to both controls and other TS subgroups. While the TS-only group performed similar to controls, a striking effect of age showed that adolescents with TS were better at inhibiting action impulses than age-matched controls, whereas individuals with TS persisting into young adulthood were much worse than age-matched controls at inhibiting action impulses. Thus TS is linked to deficient inhibitory control of prepotent motor actions, but the conclusion is far from simple. Our results point to inter-group differences, showing that comorbidity of ADHD and age may exacerbate or even reduce the deficient inhibitory control. Our findings indicate that adolescents with TS develop over-active control networks, which is not the case in young adulthood. This may reflect a TS subgroup with poorer inhibitory networks. These inter-group differences emphasize the importance of controlling for comorbidity and age when studying TS.

Poster Presentation

Strategic deployment of attentional resources as a mechanism of proactive response inhibition under different task contexts

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Efficiently avoiding inappropriate actions in a changing environment is central to cognitive control. One mechanism contributing to this ability is the deliberate slowing down of responses in contexts where full response cancellation might occasionally be required, referred to as proactive response inhibition. The present electroencephalographic (EEG) studies investigated the role of attentional processes in proactive response inhibition. In the first study, we compared Go-trial data from a standard Stop-signal task, in which Stop signals required response cancellation, to data where possible Stop signals were task-irrelevant. Behavioral data clearly indicated the presence of proactive response inhibition in the standard Stop-signal task. A novel singletrial analysis was used to directly model the relationship between response time and the EEG data of the Gotrials in both contexts within a multilevel linear-models framework. We found a relationship between response time and amplitude of the attention-related N1 component in relevant blocks, a characteristic that was fully absent in irrelevant blocks. Specifically, N1 amplitudes were lower the slower the response time was, suggesting that attentional resources are being strategically down-regulated to control response speed. In the second study, we compared data from a standard Stop-signal task to data in which successful response inhibition was rewarded. Using the same single-trial EEG analysis we found a larger N1 component in the reward context, which, however, did not scale with response speed. In contrast, Go-elicited N1s from the noreward block replicated the relationship found in experiment 1. Taken together, these two studies strongly support the notion of a dynamic and context-specific pro-active control mechanism that deploys attentional resources in a strategic manner to govern response inhibition behavior.

Poster Presentation

Core function training: Optimizing the n-back working memory task

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For various cognitive functions reaction time variability is a known indicator of performance level. Moreover, there seems to be a beneficial effect of small reaction time variability on the transfer of working memory training: The more consistent the reaction time during an n-back working memory training, the higher the transfer of the training on different cognitive tasks. In an attempt to optimize the widely used n-back working memory training we relied on this consistency effect by adding a direct reaction time feedback to the n-back task and enforcing a constant reaction time performance from the trainees in the training task itself. Training with this consistency-task, compared to an n-back training without this feedback-related response constraints, led to higher improvement in non trained working memory tasks and reduced reaction-time variability in other tasks. We conclude that this approach is a promising way to improve concentration and to strengthen the functioning of working memory.

Poster Presentation

What does the eriksen flanker task measure? An ERP investigation

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ERP studies with go/no-go tasks typically report the fronto-central N2 component to no-go trials, which is interpreted as an index of inhibitory control. Also, research with Eriksen Flanker tasks report the N2 component to incongruent trials. However, a review of the Eriksen Flanker task literature reveals that there is a striking diversity in characteristics of the reported "N2" component. The component is reported with widely varying topographies and diverse time windows, undermining its labeling as "the N2". Here we report results of a EEG large-sample longitudinal study (N=52) in which participants performed the Eriksen Flanker task. We investigated the N2 effect in the canonical version of the Eriksen Flanker task in three testing times across a 2 year period. The behavioral data showed a significant flanker effect in all three testing sessions. The effect was more prominent in the first testing session, compared to the other sessions. Despite the general consensus that the N2 occurs in the Eriksen Flanker task, we did not observe the N2 effect in ERP data. Instead, we report a frontal positivity for incongruent trials in the 200-320 ms, followed by the P3 component. The frontal positivity presumably corresponds to the Anterior P2, related with selective attention. The results suggest that a mechanism allowing conflict resolution in incongruent trials is not inhibitory in nature but relates more to intensifying processing of the targets and increasing attention to the stimuli. The data will be discussed in the light of the role of inhibitory control in the Eriksen Flanker task.

Poster Presentation

Is it just a matter of time? On the issue of an interaction between alerting and executive attention

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According to Posner and colleagues, mechanism of attention consists of three systems: alerting, orienting, and executive. In the presented study we focused on the interactions between two of them, namely alerting and executive attention. Alerting increases readiness of perceptual and cognitive systems for processing incoming stimuli. Executive attention is responsible for cognitive control, which involves resolution of conflicts. Previous studies showed that alerting decreases the efficiency of conflict resolution. It has been suggested that this effect is observed, because alerting accelerates response time (RT), thereby does not leave enough time for cognitive control to be developed and efficiently applied. If this holds true, a speed-accuracy trade-off (SAT), which supposedly decreases response selection time, might affect the interaction between alerting and conflict, i.e., increase the effects of alerting on conflict under a speed condition and decrease under an accuracy condition. To examine this hypothesis we used a modified Attention Network Test with an arrow target and flankers preceded by alerting cues in 50% of the trials and instructions emphasizing either speed or accuracy of responses (with a within-subject block design, N = 32). The results show typical effects of alerting and flanker conflict, along with increased conflict in the alerting trials, and typical effects of SAT manipulation. However, although focusing on speed or accuracy significantly affected overall RT and accuracy, the SAT did not affect the relation between alerting and conflict. Therefore the results suggest that the negative effect of alerting on conflict might not be due to a mere acceleration of RT, and the source of the effect may lie in a different than response selection stages of processing.

Poster Presentation

Control processes in individuals with high and low psychometric schizotypal personality

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Recent research has suggested that the efficiency of inhibitory control processes can be impaired in certain personality traits (e.g. schizotypy, anxiety or depression). This research explores whether individual differences in inhibitory functioning are associated with the level of schizotypy. Schizotypy is a personality trait that is related to the schizophrenia spectrum. Although it is not considered a clinical disorder, emerging research has confirmed that individuals with schizotypal personality traits are dimensionally related to those with schizophrenia. Based on previous research with schizophrenic patients, our prediction was that participants with higher scores in psychometric schizotypy would show impaired inhibitory performance relative to participants with lower scores. To test this prediction, we selected two groups of participants with high and low levels of schizotypy, respectively, according to their scores in the Spanish version of the O-LIFE questionnaire. All participants performed two inhibitory tasks; a retrieval practice paradigm with semantic categories, and the AX-CPT task, which allows one to distinguish between inhibitory and non-inhibitory executive control by providing separate indexes for reactive (inhibitory) and proactive (non-inhibitory) control . As expected, we found differences between the two schizotypy groups in the inhibitory indexes but not in overall performance in both task. Our data suggest that similar to schizophrenic patients, non-clinical individuals with high psychometric schizotypy scores showed impaired inhibitory functioning. All in all, this research supports the assumption that there might be a continuum of cognitive functioning between clinical and non-clinical levels of schizotypy.

Poster Presentation

Visual temporal integration improves working memory

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When visual stimuli are presented in quick succession (around 100 ms) at the same spatial location, they are often perceived as a single stimulus: they are temporally integrated. This phenomenon could be attributed to the innate sluggishness of the human perceptual system and seen as a disadvantage; after all, the distinctness of each stimulus is lost. However, temporal integration may also play a more active and beneficial role in visual processing, resulting in a more efficient way of encoding and maintaining visual information because fewer stimuli need to be processed individually. We investigated this by running a visual working memory task using a free recall paradigm. Two lines in specific orientations were either presented simultaneously or with varying stimulus onset asynchronies. We modelled recall accuracy and observed that participants' guess rates were lowest when the lines were presented at the same time, increasing linearly with larger stimulus onset asynchronies. Working memory precision remained unchanged. This effect could be attributed to the increased likelihood of integration of both lines into the same perceptual episode at short durations. In a follow-up study we will investigate the effects of temporal integration on working memory more directly by using the fusion of colors, which are presented at the same times as the line orientations, as a proxy of temporal integration. We hypothesize that reporting the fusion of the presented colors (i.e. yellow and red become orange) will be accompanied by more accurate line orientation recall, which would further show the benefits of temporal integration for working memory.

Poster Presentation

<div style="text-align:right">**Session C**</div>

Moment to moment priming of inhibitory control and its effects on Uncertainty

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Uncertainty is a disturbing state that affects everyone; however, its effects are more pronounced in patients suffering from Obsessive-compulsive disorder (OCD) and different anxiety disorders. Increased uncertainty had been suggested to be the core deficit in OCD. In addition, OCD patients and their immediate healthy family members suffer from deficient inhibition. We previously demonstrated that priming response inhibition improves behavioral manifestations of uncertainty over an experimental block. The current experiments were designed to test the effects of different inhibitory mechanisms on uncertainty and to improve the temporal resolution of previous findings by examining the trial-to-trial effects of inhibitory control on uncertainty. Healthy participants engaged in a novel task combining the Stroop task with a visual search task. The latter had previously been established as a useful tool to study uncertainty. Results reveal interactions between different conditions of the stroop task and the level of uncertainty induced by the visual search task. The current Findings extend prior research concerning the connections between inhibitory control and uncertainty - two main deficits characterizing OCD patients. The clinical relevance to theories of OCD and therapy as well as cognitive implications of the tasks are discussed.

Poster Presentation

Different aspects of linguistic and nonlinguist cognitive control share no variance

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Cognitive control is assumed to be a relatively unitary theoretical construct. Even more nuanced positions differentiate only a few subcomponents, such as conflict monitoring, interference suppression, context updating or response inhibition. Here we report results from a large scale longitudinal study that allowed to compare different indices of control while investigating cognitive consequences of second language instruction. This approach enabled us to test whether varied linguistic and nonlinguistic indices of cognitive control, as well as indices of general cognitive skills cluster with each other. We tested a group of 62 bilingual Polish-English high-school students varying in their cognitive profile and L2 proficiency at three times during the span of 2 years. We used a battery of tasks that are classically used to tap into linguistic and nonlinguistic aspects of cognitive control, such as the Stroop task, the Eriksen Flanker task, task switching, language switching in picture naming, semantic and phonological verbal fluency and inhibition of interlingual homographs task. The linguistic tasks were carried out in participants' first (L1) and second (L2) language. We also assessed L1 and L2 proficiency, as well as working memory capacity and IQ. Where applicable we measured both accuracy and reaction times. Most of the measures showed a large variability across participants and testing times. Yet, to our surprise, correlations and factor analyses showed hardly any clustering across the measures. Even among the linguistic measures of cognitive control, the L1 and L2 versions of the tasks overwhelmingly had separate sources of variance. The results suggest that cognitive control consists of a large number of independent skills, and it is unlikely that training in one task will transfer to another. The findings will be discussed in light of current theories of cognitive control.

Poster Presentation   **Session C**

Effect of physiological relevance on distraction by deviant sounds: Unexpected food words distract hungry participants

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Rare changes in a stream of otherwise repeated task-irrelevant sounds break through selective attention and disrupt performance in an unrelated visual task (1) by triggering shifts of attention to and from the toward the deviant sound (deviance distraction) and (2) when the involuntary semantic processing of the deviant sound interferes with the voluntary processing of the target stimulus (semantic effect). In our study, we examine whether the semantic contents of deviant sounds can modulate distraction on the basis of their relevance to the participant's physiological needs (instead of their task-set overlap with the primary task). We report the results of an experiment in which hungry and satiated participants partook in a cross-modal oddball task in which they categorized visual digits (odd/even) while ignoring task-irrelevant sounds. On most trials the sound was a sinewave tone (standard sound). On the remaining trials, deviant sounds consisted of spoken words related to food (food deviants) or neutral words (neutral deviants). The results showed equivalent levels of overall deviance distraction (all deviants versus standard sound) in both groups. However, food deviants produced greater distraction (longer response times) than neutral deviants in hungry participants while the reverse effect was observed in satiated participants (semantic effect). This semantic effect was visible in the first block of trials but disappeared thereafter, possibly reflecting desensitization to the deviant words across the task (corroborated by the reduction of deviance distraction across the task). Our results suggest that (1) the semantic content of deviant sounds is involuntarily processed even when sharing no feature with the primary task; and that (2) distraction by deviant sounds can be modulated by participants' physiological needs.

Poster Presentation

Carbohydrate consumption, exercise and cognitive performance in school children

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There is increasing evidence that dietary components can modulate brain functions and cognitive performance even though the underlying mechanisms by which individual macro-and micronutrients act on the brain are not fully elucidated. In this context, carbohydrates have received particular attention as the delivery of glucose from dietary carbohydrates is critical for energy supply to the brain. Moreover, the glycemic characteristics of carbohydrates are thought to have modulating effects on cognitive functioning (e.g. Benton, 2003). The current study assessed the effects of different carbohydrate intake on cognition and mood in school-children. 58 children aged between 10-12 years completed 4 trials, 3 carbohydrate drinks of differing GI versus water, in a randomized, cross-over design. Cognitive performance and mood was measured at baseline and one hour post-ingestion of the drink. Cognition, specifically attention and memory was measured using the Cognitive Drug Research Battery. Additional measures on speed of information processing and coding digital symbol were also included. Post-treatment the children underwent a 30 minute exercise protocol equivalent to mild exertion in all conditions. For all cognitive outcome measures, difference scores were calculated by subtracting the baseline score (pre-dose) from the post-dose score. No effects were found prior to consumption of the drink. Body Mass Index (BMI) was found to be significantly correlated with a number of outcome measures at baseline and was treated as a covariate in all subsequent analysis. A main effect for treatment on accuracy of attention was significant. The decrease from baseline in accuracy of attention was greatest in the placebo arm compared to the carbohydrate arms, with the least decrement in accuracy occurring after the low GI carbohydrate. These findings did not extend to measures of working memory and speed of information processing, suggesting that attentional components of cognitive functioning may be more susceptible to such dietary manipulations.

Poster Presentation

Tablet-based visuo-spatial training tool for preschoolers

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In the context of numerical development, visuo-spatial skills are are assumed to provide an early foundation for later mathematical learning. First evidence for positive effects of visuo-spatial training on numerical performance in children has recently been provided (Cheng & Mix, 2014). In sum, visuo-spatial training can be considered as being a promising approach for enhancing young children's early math performance and providing them with a sound foundation for later mathematical learning. Nevertheless, rarely any visuo-spatial training material is currently available for the preschool setting.

Based on this, we have developed a tablet-based visual-spatial intervention tool for preschoolers. This tool has been specifically designed for the school setting and should be administered by a teacher to a whole classroom or a small group of children.

In terms of design, the tablet workspace is conceptualized as an electronic blackboard being used in combination with external material such as booklets. A multitude of tasks targeting different levels of visual-spatial abilities have been developed and will be presented.

This tool is currently being scientifically evaluated in the context of a first classroom based intervention study in Luxembourgish kindergartens (N=127). In a pretest-posttest design, we are evaluating changes in visuo-spatial abilities and potential transfer effects on numerical abilities in the intervention group (n=69) compared to a "teaching as usual" control group (n=58). The intervention is carried out twice per week (20 minutes per session) over a period of 10 weeks.

Results will be available after the completion of this study by the end of July. In September we will be able to present the first results obtained with this innovative training tool and to discuss, whether our hypotheses could be confirmed or to what extent adaptations are needed.

Poster Presentation   **Session C**

Does orthographic knowledge influence performance in immediate serial recall of spoken words?

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It is now well acknowledged that the processes of verbal short-term memory (STM) benefit from the availability of rich and easily accessible lexico-phonological long-term representations. Although phonological and orthographic representations are highly interconnected in the language networks of literate persons, the potential support of orthographic knowledge on verbal STM remains little explored. The aim of our study was therefore to investigate this issue in young readers (8-year-old). We compared performance in auditory immediate serial recall of five-word lists. Four types of word lists were constructed. In the control condition, word rimes were phonologically and orthographically dissimilar. In the two other conditions, word rimes were both phonologically and orthographically similar (as in the French, classe, brasse, chasse, etc.). Finally, in the fourth condition, word rimes were phonologically similar but orthographically dissimilar (as in the French sport, bord, corps, nord, store, all ending with /oR/). We also evaluated the reading and spelling abilities of the participants, as well as their non-verbal reasoning and vocabulary. We observed that, in comparison with word lists phonologically and orthographically similar, the inter-items orthographic dissimilarity in rhyming lists assists the recall of item information (i.e., number of items recalled independently of serial position) but not the recall of order information. In addition, the size of this orthographic effect was highly correlated with performance in irregular word reading (a task that is generally viewed as reflecting orthographic processing abilities). These findings suggest that orthographic representations in young readers can be quickly activated in immediate serial recall, even when the stimuli are presented in auditory modality. However, orthographic knowledge seems to support the short-term memory for item but not for order information. This influence also seems highly dependent on the children levels of reading and spelling.

Poster Presentation

Following instructions from working memory: Why does action at encoding and recall help?

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Three experiments investigated why performing actions when either receiving or recalling instructions improves children's recall. In Experiment 1, children recalled sequences of spoken action commands under encoding and recall conditions that either involved physical performance or did not. Memory for instructions was enhanced by enacting the instructions at encoding and by performing the actions at recall. Working memory was associated with the recall of spoken but not enacted instructions, suggesting that action-based encoding does not depend on working memory. In a second experiment designed to test the hypothesis that the enactment advantage at encoding simply reflects the benefits of two distinctive presentations, an additional presentation condition was added in which spoken instructions were also displayed orthographically at encoding. Unlike physical enactment, orthographic repetition did not boost recall. It also eliminated the action advantage at recall. These results rule out the dual presentation hypothesis. In a final experiment designed to determine whether enacted instructions are better retained because they are self-generated rather than passively received, an additional presentation condition was added in which spoken instructions were repeated (i.e. shadowed) by the participants. In contrast to enactment, shadowing did not enhance recall relative to passively listening to spoken instructions. These results rule out the dual presentation and selfgeneration hypotheses. Across all three experiments there were equivalent benefits to action-based recall both when there was enactment at presentation and when there was not. These findings indicate that the positive effects of enactment at encoding and recall have distinct rather than common mechanisms. It is proposed that the action advantage at recall arises from the existence of a motor store for planned actions within working memory, while executing motor sequences at presentation may enhance representations in episodic memory.

Poster Presentation

Relationship between planning abilities and temperamental features in Russian adolescents

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M. Rothbart's concept of self-regulation is considered in terms of effortful control, which is defined as the ability to inhibit an automatic response in order to execute voluntary actions, plan and to detect errors. Planning ability acts as one of the most important components of behavioural regulation. The study of the etiology of the relationship between temperament and cognitive functions is of particular interest. The pilot study involved 50 adolescents aged 10 to 14 years (mean age 12.3 years, standard deviation 1.2 years), 15 boys and 35 girls. To assess the planning ability the participants were asked to pass an experimental psychological test 'Stocking of Cambridge' (SOC) from the CANTABeclipse battery. The participants also completed the self-report form of the M. Rothbart's Early Adolescent Temperament Questionnaire (EATQ-R). To assess the relationship between planning ability and temperamental features we calculated Pearson correlation. The results of the pilot study show a statistically significant negative correlation between the mean initial thinking time for 5 moves and 'Negative affect' ($r = -0.307$; $p = 0.04$). Also a statistically significant correlation between the mean initial thinking time for 4 moves and 'Extraversion' was found ($r = 0.297$; $p = 0.05$). The "effortful control" seems to be most relevant to the planning ability. We did not find any statistically significant correlations between effortful control and planning efficiency. However, we found statistically significant correlations between the facets of effortful control and planning efficiency. The results provide the ground for multivariate genetic analysis to explore the etiology of the relationship between planning ability and temperament

Poster Presentation   **Session C**

The role of instructions in learning-based reconfiguration of task sets

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Previous research indicates that instructed task rules determine how humans represent and perform a task. Moreover, instructed task sets seem to shield goal-directed performance from distracting influences. In the present study we investigated whether this "stabilizing function" of instructions hinders or even prevents incidental learning and use of regularities not mentioned by instructions, compared to situations in which task sets are established by trial-and-error learning. We used a global-local paradigm that required responding to the identity of local target letters embedded in global letters not in the target set. We compared conditions in which participants received S-R mapping instructions with conditions in which they had to find the (same) rules by trial and error. After establishing the task set, people were exposed to incidental learning blocks in which irrelevant global letter identity covaried with the required response. Incidental learning and use of irrelevant global letter identity was measured by way of global-local deviants. Participants in the instructed conditions showed less evidence for learning-based use of global letter identity for responding than participants in the rule finding conditions, indicating that instructions aggravate mental set effects and indeed hinder incidental learning and use of task-irrelevant regularities.

Poster Presentation

An examination of domain specific and general executive function in developmental dyslexia

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The extent to which executive function (EF) - inhibition, updating and switching- are functionally implicated in developmental dyslexia is unclear. Potential reasons for inconsistent findings include problems with: (1) task impurity, (2) task content (e.g. phonemic (sound), alphanumeric, images), and (3) confounding variables. Dyslexia appears to be associated with socio-emotional behaviour problems which are indicative of impaired self regulatory capacity due to EF problems. Yet, the relationship between EF and socio-emotional behaviour problems in dyslexia is unknown. Incorporating and addressing potential reasons for inconsistent findings this study aims to: (1) examine EF in dyslexia using 'pure' tasks (tasks that measure latent EF constructs using Miyake et al. (2010) framework); (2) examine if EF ability/impairment is specific to processing phonological information or general information in dyslexia; (3) examine how EF relates more globally to self-regulation failures and reading ability in dyslexia. Sixty children (30 dyslexia, 30 control) aged 10-12 years took part in the research study. Participants completed a battery of phoneme specific and general measures of inhibition, updating and switching, as well as measures of reading ability and socio-emotional behaviour problems. Preliminary analysis based on 15 participants (10 dyslexia, 5 control) revealed that dyslexia is associated with a general switching impairment ($F_{(1, 13)} = 5.806$, $p=.032$), which is predictive of word reading ability (adjusted $R^2 =.33$, $p=.01$). Dyslexia is also associated with significant socio-emotional problems, which are predicted by general updating ability (adjusted $R^2 =.23$, $p=.04$). Preliminary results indicate: (1) a switching impairment in dyslexia which may be implicated in reading impairments; and (2) socio-emotional behaviour problems in dyslexia which may be underpinned by a general updating impairment. The implications of these results will be discussed.

Poster Presentation

Bridging the gap between slots and resources models of visual working memory: A hierarchical framework

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One of the most prominent debates in the study of visual working memory (VWM) regards the nature of the constraints on maintenance of representations. The stances in this debate divide into two major classes of models. According to slots models (e.g., Luck & Vogel, 1997; Rouder et al., 2008), VWM is constrained by a limited number of discrete representations held simultaneously. On the other hand, resource-based models (e.g., Bays & Husain, 2009; Wilken & Ma, 2004) argue that VWM is limited in resources that can be allocated and distributed flexibly between a varying number of representations. We suggest that this controversy can be reconciled by a framework that consists of a two-level hierarchy of memory stores, each containing different sets of representations, with one constrained by resources and the other by slots. Building on the notion of fragile short-term memory (e.g., Sligte et al., 2008), we suggest that the first level is a large-capacity mechanism which stores detailed viewpoint-specific representations of most of the visual array. This level is constrained by resources, manifesting in representations receiving different amounts of activation. The second and higher level is a smaller memory set, which is limited by the number of slots and contains representations that are more conceptual. Critically, performance in many tasks relies on both sets of representations, making it hard to distinguish them empirically. Basing on models of working memory gating (e.g., O'Rielly & Frank, 2006), attentional selection is understood in this framework as controlling the mobilization of representations between the two stores (similarly to the notion of a gatekeeper). We discuss how this framework explains findings regarding capacity estimations, binding and the retro-cue effect. Finally, we address the relations between this framework and models of working memory in other modalities (e.g., Cowan, 1999; Oberauer, 2009).

Poster Presentation

Both the objective performance and the subjective feeling of urge to err influence cognitive control in conflict tasks

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In conflict task, conflicting or incongruent trials take more time to be resolved than congruent trials (e.g. congruency effect). Furthermore, this congruency effect is smaller after an incongruent trial than after a congruent trial (e.g. congruency sequence effect, CSE) and we slow down after an error (e.g. post error slowing). It suggests that cognitive control increases after processing difficult trials. The observation of congruency effect is not limited to reaction times and error rates but has also been observed in subjective experience. Morsella and colleagues (2009) observed a congruency effect on the reported urge to err: participants reported a higher urge to err on incongruent trials. Recently, Desender and colleagues (2014) observed a close relation between the CSE on error rates and the reported feeling of conflict. Our study aimed to explore the nature of the relation between the objective performance (e.g. RT and error rate) and the subjective report in conflict tasks. Stroop trials were presented in pairs of two consecutive trials. After the second trial, participants reported their urge to err either for the first or for the second trial. When participants reported on the first trial, a "post urge to err slowing" was observed meaning that participants were slower if a high urge to err was reported on the first trial. Furthermore, when participants reported their urge to err on the second trial, a CSE-like effect was observed on the verbal report itself: the congruency effect on the reported urge to err was higher after a congruent than after an incongruent trial. Our results demonstrate a reciprocal relation between the subjective experience of urge to err and the objective performance. As such, our study informs about what is actually driving cognitive control in conflict tasks.

Poster Presentation

Task representations in dorsolateral prefrontal cortex

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In cognitive experiments, participants are often required to perform tasks where they have to apply simple rules, such as "if target is a square, press left". In everyday life, however, behavior is more complex and may be governed by collections of rules - task sets - that need to be selectively applied in order to achieve a goal. While previous research has demonstrated the involvement of dorsolateral prefrontal cortex (dlPFC) in representation and maintenance of relevant task sets, the nature of this representation remains an open question. One possibility is that task sets are represented as the coactivation of multiple neurons, each of which codes for a single rule. An alternative possibility is that the activity of individual neurons encodes the conjunction of simple rules. In order to answer this question, subjects performed a delayed- match-to-sample task while undergoing fMRI. On each trial, subjects were shown a cue indicating one of three possible task sets: color/orientation, orientation/shape or shape/color. A sample stimulus was then given and participants had to memorize the relevant dimensions of this stimulus given by the task set cue. They then had to respond how many dimensions of the sample stimulus matched the target stimulus. A control condition was included in which subjects indicated whether the direction of an arrow matched a cued direction. Each task set had one rule in common with another task set and the other rule in common with the remaining task set, allowing us to ascertain through multivariate decoding if neural representations are conjoined (classification above chance) or coactivated (classification at chance level). Univariate analyses show error effects of task set trials in mPFC, and increased bilateral DLPFC activation in control trials versus task set trials. Multivariate pattern analysis results and its implications are discussed as well as possibilities for future research.

Poster Presentation

Two routes of retrieval from visual working memory

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When maintaining visual features, such as colour, in visual working memory, feature locations are also memorised. This effect occurs even when location is task irrelevant. Change detection tasks have shown that feature location memory influences feature retrieval (Treisman & Zhang, 2006). Understanding whether feature-location binding is strategic or obligatory will influence models of the structure of visual working memory. In this study, participants were shown a to-be-remembered display containing three coloured shapes. After a brief blank interval, a test display containing either one ('single probe') or three ('full probe') coloured shapes was presented. Participants decided if a new feature was present. Presenting test items in new locations reduced performance for full probes, but not single probes. This difference may be because changing object locations scrambles the spatial configuration of full probes, but not of single probes. Therefore, embedding single probes within a spatial configuration may produce location-based retrieval for single probes, as well as full probes. In experiment 1, the background of the change detection task was either grey or textured (created using 1/f noise). In experiments 2 and 3, the task background consisted of squares which occupied potential object locations. In experiment 4, participants were presented full probes, with a single item indicated as the target by a spatial cue in the test display. We consistently found that, for single probes, there was no detrimental effect of changing locations, irrespective of whether a spatial configuration was present. When full probes were presented, there was a detrimental effect of changing item locations, irrespective of whether participants made decisions about the whole display, or just a single item. These findings support the existence of two retrieval processes in visual working memory. Feature retrieval is guided by location memory, but only when the spatial configuration matches between study and test.

Poster Presentation

Maintenance of verbal and spatial information in working memory during concurrent processing: The contribution of the phonological loop

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According to the time-based resource sharing model of working memory (TBRS, Barrouillet & Camos, 2015), recall performance in complex span tasks depends on cognitive load, the ratio between the time allocated to the concurrent task and the total time available to perform it. When cognitive load is kept constant, the number of intervening processing episodes should not affect maintenance. We tested this hypothesis in a complex span task in which participants had to maintain sequences of letters or spatial locations, each memory item being followed by 2 to 8 processing episodes (deciding whether a given number was the smallest of a set of four numbers). A constant refreshing time of 600 milliseconds was added after every processing episode in order to keep cognitive load constant. Our results show that, as the TBRS predicts, the number of processing episodes had no effect for the maintenance of verbal information (letters), but it did for visuospatial information (spatial locations). Contrary to the former, the latter degraded as the number of intervening processing episodes increased. However, when verbal information was presented under articulatory suppression (repeating the syllable "ba"), the recall pattern over intervening processing episodes resembled that of spatial information. This suggests a role for the phonological loop in the resistance of verbal information to decay and interference. In a follow-up experiment, the generalizability of this result was tested by manipulating the cognitive load of the concurrent task. Implications for the TBRS model and working-memory are discussed.

Poster Presentation   **Session C**

Directional flow in working memory network: A TMS-EEG study

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Recent human electroencephalography (EEG) studies have shown that global theta phase synchronization between the frontal and sensory areas has been suggested to connect the relevant areas for executive processes of working memory (WM). However, directional flow (i.e. either top-down or bottom-up) of such network in WM remains unclear. Previous studies based on transcranial magnetic stimulation (TMS) and EEG have suggested that single-pulse TMS can modulate local synchronization of in-targeted neural areas and induce spatial propagation during a resting state. We hypothesized that this method is applicable during cognitive states and we could identify network directionality within WM network by focusing on TMS-induced changes in EEG rhythms during WM tasks. For example, if phase synchronization changes when TMS is applied to the frontal area, directionality is likely to be top-down. In contrast, if phase synchronization changes when TMS is applied to the sensory areas, directionality is likely to be bottom-up. In this study, we aimed to examine the effect of single-pulse TMS to WM related brain regions during WM tasks and to clarify directional flow of WM network. Two types of WM manipulation tasks [an auditory WM task (AWM) and a visual WM task (VWM)] were performed, and single-pulse TMS was applied to three target areas (frontal area, visual area, auditory area). The tasks were also performed during sham TMS and within a no-TMS condition. As expected, TMS manipulated brain activity with global phase synchronization during WM tasks. We found TMS-induced increases in theta phase synchronization and the changes were observed only when TMS was applied to the sensory areas but not the frontal area. These findings suggest that directional flow of WM network is bottom-up rather than top-down.

Poster Presentation   **Session C**

Is working memory capacity important for solving insight problems?

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The purpose of our study was to find the relationship between working memory capacity and efficiency of solving insight problems. The insight is treated here as a result of implicit learning interacting with explicit learning (Dienes & Perner, 1999; Frensch et al, 2002; Nissen & Bullemer, 1987; Reber, 2013; Sun, Zhang, Slusarz & Mathews, 2007). Working memory is a part of the cognitive system responsible for temporary information storage and processing (e.g. Baddeley, 2003, 2010; Shah i Miyake, 1999). It determines the efficiency of higher order cognitive functions, including reasoning and problem solving (Hambrick & Engle, 2003; Koeneke, Lutz, Wüstenberg, & Jäncke, 2004; Miyake & Shah, 1999; Su, Oberauer, Wittmann, Wilhelm, & Schulze, 2002). An important aspect of working memory is its ability to initialize storing and processing even in uncouscious and automatic manner (Hassin, Bargh, Engell & McCulloch, 2009). This is why we hypothesized that people with higher level of working memory capacity would solve an insight task better than those with lower level of working memory. There were 35 subjects aged from 20 to 32, who gained the lowest (N = 19) and the highest scores (N = 16) in the O-span task during selection tests. Both groups solved the insight task similarly. The analysis of differences in reaction times revealed that the process of implicit learning did not occur. Although the results of the conducted research did not confirm our hypothesis, it is worth noting that further research should take into consideration the possibility of dividing people into three groups (solvers, nonsolvers and quasi-solvers) instead of two groups (solvers vs. nonsolvers). This enlarged number of categories of dependent variable could better permit to find what exactly distinguishes solvers from quasisolvers, leading to answer the question: "What enables people to solve problems more efficiently?"

Poster Presentation

Zero is not 'nothing'

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The current study tested the non-symbolic representation of null numerosity (i.e., an empty set) in comparison to the symbolic representation of the number zero using the magnitude comparison task. In a series of experiments we manipulated the context by varying the type of magnitude notation or the perceptual features of the stimuli. Experiment 1 tested comparisons of the magnitudes from 0 to 9 in three different notations: symbolic, nonsymbolic and heterogeneous notations. The results revealed an attenuated distance effect for comparisons to null numerosity than for comparisons between pairs of numerosities 1-9. Experiment 2 aimed to examine whether the results of Experiment 1 marked perceiving null numerosity as zero (i.e., the smallest number in the set). This was done by contrasting comparisons to an empty set with comparisons to an abstract picture that had no numerical meaning. Experiment 3 examined whether 'zero' is perceived as 'nothing' by manipulating task instructions. The results of these experiments show that perceiving 'zero' as nothing is reliant upon the context in which it is presented. The implications of the results are discussed in light of number representation models.

Poster Presentation

One tamed at a time: Estimating the role of non-numerical magnitudes on size perception

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How do we make size estimations? Are our estimations based on numerosity or other non-numerical magnitudes (e.g., area)? The purpose of this work is to examine the effects of different non-numerical magnitudes on non-symbolic size comparisons. We approached this question using a new set of dot-array stimuli. We compared the ratio of a non-numerical magnitude (average diameter, total area and density) to the ratio of the numerosities of these stimuli. Our results suggest that some non-numerical magnitudes are more important than others in size estimations. In addition, we were able to compare the difficulty of the numerical and continuous tasks.

Poster Presentation

Dissociation between numerosity and length processing within the right parietal cortex: a TMS-adaptation study

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A broad range of behavioural, physiological and neuroanatomical data suggests that various magnitudes may share a common representational medium in the parietal cortex (Walsh, 2003). In support of this proposal, common parietal activations during numerosity, length and duration processing have been observed in fMRI studies (Dormal et al., 2009; 2012). However, the limited spatial resolution of fMRI does not allow one to exclude the possibility of an overlap merely due to anatomically intermingled distinct neuronal populations, as demonstrated by electrophysiological results in monkeys (Tudusciuc & Nieder, 2007). Determining whether the overlap of activations observed in the intraparietal sulcus (IPS) in processing various magnitudes corresponds to a real functional overlap or rather to separate and intermingled neuronal populations thus constitutes a critical issue. Here, we used an adaptation paradigm combined to online repetitive TMS in healthy participants. By using behavioural adaptation (i.e., repeated presentation of an eliciting stimulus that results in the decline of the elicited behaviour) to manipulate neural activation states prior to the application of stimulation, one can control which neural populations are preferentially affected by the stimulation (Silvanto et al., 2007). Participants performed both numerosity and length categorisation tasks just after a period of adaptation to either numerosity or length. During the categorisation judgement, participants received a train of stimulations either on the right IPS or on the vertex taken as a control site. The results showed a typical behavioural adaptation effect for both numerosity and length after stimulation over the vertex: participants were significantly slower to process the adapted category compared to the nonadapted one. Importantly, after right IPS stimulation, the reverse effect was only observed in the numerical categorization task. This dissociation suggests the presence of a neuronal population coding specifically numerosity within the right IPS.

Poster Presentation   **Session C**

The ordinal SNARC effect: An attempt to replicate

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A stable finding in many different studies that examined the association between number and space is the SNARC effect. The SNARC effect is characterized by a more efficient response to small numbers with the left hand and to large numbers with the right hand. The classic explanation to this finding was provided by Dehaene et al (1993) claiming that numbers are arranged from left to right in LTM, on the MNL according to their magnitude. In the present study, we attempted to replicate Van Dijck and Fias finding showing a SNARC based on the ordinal location of the numbers presented in working memory, on Hebrew speaker participants. We manipulated the parity-to response side within participants with a week interval. Our paradigm allowed the estimation of the SNARC effect as correlation with d(RT) (the difference in latency between the right and the left hand) for both numerical magnitude and serial position in WM. The results indicated a left-to right SNARC effect for magnitude but not an ordinal position. Possible causes for this failure of replications are discussed.

Poster Presentation

Spatially-congruent auditory presentation modulates performance in a serial addition task

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Recent research on mathematical cognition suggests that adding or subtracting numbers implies right- or leftward attentional shifts on the spatial representation of numbers (i.e. the mental number line). Consistent with this notion, we hypothesized that an auditory-induced attentional shift during the solution of arithmetic problems would modulate task performance. More specifically, we expected that solving additions is more efficient during congruent presentation of operands (from left to right) compared to incongruent presentation (from right to left). Twenty-participants solved sequences of additions while the presented operands "moved" congruently, incongruently, or stayed stationary. The sounds were prerecorded using a binaural microphone and presented via headphones during the experiment. As expected, the direction of auditory presentation modulated the response times. Additions were solved faster when the operands were presented congruently from left to right compared to the incongruent condition. We argue that dynamic shifts of spatial attention play an integral role in mental arithmetic.

Poster Presentation

Bilingual developmental dyscalculia

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Developmental Dyscalculia (DD) is a learning difficulty in children with normal intelligence which affects the acquisition of school level arithmetic skills and magnitude representation. Most research has focused on monolingual children and little is known about how bilingual DD children process magnitude. Given the impact that the language for early math learning (Language of Learning math - LLmath) has in our core magnitude processing (Salillas and Carreiras, 2014; Salillas et al., 2015) here we explore the implications of having one preferred language for math in an already defective DD numerical knowledge. Using an adaptation paradigm, we compared the distance effect in bilingual DD children between the ages of 7.5 and 13.5 and their matched controls in both languages: LLmath and in the Other Language (OL). The task consisted of a numerical adaptation task where the deviants' numerical distance relative to the standards was manipulated. 6 number words were used to create 16 stimulus sequences consisting of 10 stimuli, in which the 10th stimulus was the deviant form. The stimulus were sequences presented in LLmath or in OL. The DD group showed a considerable delay with respect to the control group in the latency of the ERP distance effect. ERP source analysis showed that that the distance effect to LLmath input is consistent in both groups sharing similar left parietal activations. With an input in the OL, computing numerical distance required of executive, frontal activations, especially in the bilingual DD group. Finally for OL, both groups shared bilateral intraparietal activation but with a difference in the relative implication of left and right parietal areas. Results suggest that bilingual DD might entail an extra difficulty and possibly a different processing of magnitude knowledge when the input is in the non-preferred language.

Poster Presentation

Shifts of spatial attention during mental arithmetic : Evidence from a temporal order judgement task

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People often rely on a visuospatial medium to manipulate numbers. Previous studies showed that numbers are generally represented in ascending order on a left-to-right oriented continuum. Because the representation of numbers is spatially oriented, it has been assumed that solving arithmetic problems involves shifting attention toward the side of the continuum where the answer is represented. Based on previous work in neglect patients, we predict that the interaction between mental arithmetic and spatial attention is determined by the relative position of the answer on the visuospatial continuum : subtraction should shift attention leftward because the answer is smaller than the first operand, whereas addition should shift attention rightward because the answer is larger than the operands. In the present study, we used a temporal order judgement task to evidence the attention biases induced by arithmetic operations. Participants had to determine which of a left or right target appeared first on the screen while solving subtraction and addition problems. The left and right targets were flashed with different stimulus onset asynchronies to find the asynchrony at which participants gave an equal proportion of left and right responses. Results showed that this point of subjective simultaneity was larger when participants were solving subtraction problems compared to addition problems, meaning that the right target should be presented several milliseconds in advance to the left target to be perceived as simultaneous during subtraction. This finding indicates that attention was biased to the left side of space during subtraction compared to addition. The just noticeable difference was also larger when participants were solving subtraction problems compared to addition problems, indicating that subtraction decreased sensitivity to temporal asynchronies between the left and right targets. We conclude from these results that mental arithmetic shares common resources with spatial attention.

Poster Presentation

Mental rotation performance in older people: The influence of gender-stereotyped material and gender differences

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Gender differences in mental-rotation tasks favoring males are a main topic of research (Voyer, Voyer, & Bryden, 1995). They are prominent in children and younger adults if psychometric mental-rotation tests are used. One explanation for this gender difference is that the stimuli (cube figures) resemble boys' toys more than they resemble girls' toys. Until now there are only two studies investigating gender differences in mental rotation in the elderly (Jansen & Heil, 2010; Jansen & Kaltner, 2013). In the latter study, it was shown that gender differences still exist in older people between 60 and 74 years when human figures and letters are used as stimulus material. The main question of this study is whether gender differences exist in the elderly when familiar, genderstereotyped stimuli are administered. 70 older adults (M=69.64; SD=6.64; 31 females and 39 males) participated and solved a mental-rotation test with gender-stereotyped items (e.g. screwdriver as a male item, mirror as a female item). Furthermore, the familiarity with the material was measured. Concerning mental rotation performance, the results show no main effects of material ($F(1,66)=0.012$, $p=.913$, $\eta2=.000$) and gender ($F(1,66)=0.797$, $p=.375$, $\eta2=.012$;) but a significant interaction between both factors ($F(1,66)=4.998$, $p<.05$, $\eta2=.070$). Females showed a better performance in the test with female stereotyped items, males in the test with male stereotyped items. There was a significant correlation between mental rotation performance and familiarity ($r=.497$; $p<.001$). Due to this relation, we included familiarity as a covariate in the former analysis. In the covariate analysis, the significant interaction disappeared ($F(1,65)=1.27$, $p=.264$, $\eta2=.019$). At a first glance, the results seem to partly confirm the study of Jansen and Kaltner (2013), detecting gender differences in the mental rotation performance of the elderly. At a second glance, however, the gender effect in this age group rather seems to be a familiarity effect.

Poster Presentation

Is there symmetry in motor imagery?

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Motor imagery is assumed to rely on similar processes as motor execution. On the behavioral level imagined and executed movements often (but not always) have similar durations. In the present study we investigated whether bimanual coordination constraints (symmetric movements are performed faster than parallel movements) can be observed in motor imagery. Repetitive symmetric or parallel movements were either executed or imagined in three different tasks. In the number task a certain number of repetitions were performed and we recorded movement duration. In the duration task movements were performed for a fixed duration and participants reported the number of repetitions. In those two tasks inter response intervals (IRIs) were calculated as the dependent variable. In the synchronization task movements were performed in synchrony with a metronome at 9 different speed levels and participants rated the perceived accuracy of their performance. In parallel, in comparison to symmetric movements, IRIs were longer or performance was rated less as accurate. This was the case in imagination and in execution. In imagined in comparison to executed movements IRIs were longer or performance was rated as less accurate. In sum, imagined and executed movements were both affected by bimanual coordination constraints. This gives further support to the assumption of functional equivalence of executed and imagined movements. However, imagination of repetitive bimanual movements was more difficult than execution (longer IRIs, lower ratings of performance accuracy). This might indicate that the need to inhibit overt execution and/or attention to usually automated details of movements may impair performance in imagination.

Poster Presentation

Does tactile and visual mental rotation depend on a specific sensory experience? Testing the perceptual equivalence hypothesis

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Mental rotation (MR) has been generally described as soliciting a visual strategy regardless of whether participants perform an MR task using touch or vision. Studies consistently show similar RT/accuracy functions to angular disparity and also visual activation during both visual and tactile MR of 2D stimuli (Prather & Sathian, 2002). In the present study, we tested whether MR on real 3D stimuli is a perceptually equivalent (or visual) process by using a within subject's design. We compared subjects on two consecutive tasks of 56 trials, either in different modality conditions (Visual-Tactile and Tactile-Visual) or same modality conditions (Visual-Visual and Tactile-Tactile). Our results show different effects of visual and tactile angular disparities on MR. Moreover, transfer analyses suggest that both visual and tactile MR can solicit sensory specific strategies, while visual experience shows no beneficial effect for tactile MR.

Poster Presentation

Environmental influences on spatial memory: A study with Space Syntax

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Recent findings in spatial cognition suggest that when people navigate space, they process and memorize spatial information by relying on an allocentric reference system that is centered on the environment. However, what is not yet known is how exactly properties of the environment influence spatial perception and memory. This study employed Space Syntax techniques to investigate the relation of environmental properties on the spatial memory created from navigating an unfamiliar environment. Specifically, it attempted to predict performance on spatial memory retrieval tasks using formal measurements about the environment obtained from Space Syntax analyses. Findings revealed strong relations between these measures and participants' pointing error suggesting a close connection between variables such as the connectivity, integration and mean depth of a spatial layout and the way the spatial layout is held in memory.

Poster Presentation

Continuous compatibility – Controlling action and perception in tracking tasks

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Inspired by information processing theory, most paradigms in cognitive psychology still implicitly or explicitly assume a sequence of processing that starts with perception, followed by cognition and ends with action. However, the effects of our actions are usually the stimuli for our next action and thus, most actions change perception of the environment. Accordingly, the approach above may be limited, as the focus on a specific snippet of the sequence may restrain the search for general principles of behavior. We used a different approach to investigate perception-action interaction by employing continuous tracking paradigms, in which actions produce consequences that serve as stimuli for subsequent actions. Thus here actions serve the control of perception. In a first step, we transferred a classic spatial compatibility paradigm to a tracking task on an iPad. This allowed us to determine whether perceptual features of a to-be controlled target stimulus affect control efficiency. We manipulated the spatial compatibility between manual actions and the target stimulus. Actions were, or were not, spatially compatible with the to-be-controlled (relevant) feature of the target, or with a not-to-be controlled (irrelevant) feature of the target. In both cases, control performance dropped with incompatible relationships, presumably by violating learned associations between movements and their perceptual consequences. We believe that such paradigms capture the idea that action is the control of perception more appropriately, and might therefore foster our understanding of the interplay of human perception and action.

Poster Presentation

Investigating the role of the dorsal premotor cortex in the formation of auditory-motor associations: a preliminary TMS study

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Previous studies have demonstrated a close link between the auditory and the motor system in both musicians and non-musicians. However, it remains unclear which brain regions are involved in the formation of auditorymotor associations. The premotor cortex, and specifically the dorsal premotor cortex (dPMC), seems to play a key role in auditory-motor integration and in mapping the association between a sound and the movement used to produce it. We tested the critical role of the dPMC in establishing this mapping via TMS in an auditorymotor learning paradigm. 24 non-musicians were tested on their ability to match a set of four pitches to four keys on the computer keyboard. Participants were then divided into two groups, who underwent 15 min of offline low-frequency repetitive transcranical magnetic stimulation (rTMS), either over the dPMC or over V1 (control site). Both groups then received training on an auditory-motor association task in which they had to listen to and then try to reproduce a series of 45 melodies (5 notes long). Following training participants were again tested on the pitch-matching task. Preliminary results showed that the group that received 1 Hz rTMS over the dPMC showed no improvement on the pitch-matching task following training whereas the V1 group did. This suggests that rTMS over dPMC disturbs the formation of auditory-motor associations. The present results contribute to a better understanding of the role of dPMC in auditory-motor integration, suggesting a critical role of dPMC in learning the link between an action and its associated sound.

Poster Presentation   **Session C**

Change of irrelevant features in tasks as the way of regular errors' correction

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The current study investigated the ways of prevention and correction of regular errors in the learning process. There is much evidence that errors appear regularly and are repeated during the learning process but these regularities are usually only detected after completion of the learning process and, as a consequence, they tend to be consolidated. We assume to asses the influence of irrelevant features in tasks to the occurrence of regular errors. It's important to determine the confines of the negative choice aftereffect and to find the conditions which can reduce it. Furthermore investigation of the mechanism of errors correction plays great role in the understanding of learning process. We assume that change of irrelevant features in stimuli exchanges the situation and the task for person, while the task and the relevant features in stimuli are the same. Therefore we suppose that change of irrelevant features in tasks results in reduction of regular errors. There are two experiments in our research aimed at identifying similar stimuli. We compare the groups with and without change of irrelevant features of the experimental task. We use color variation of stimuli as irrelevant features. Also we use different types of irrelevant features' change (regular and irregular). It was shown in our both experiments that there were less repeated errors in the group with regular change of irrelevant features than in groups with chaotic changes and without any changes. Thus, changes of irrelevant features in tasks led to activation of conscious control, causing reduction of regular errors.

Poster Presentation

Is conflict adaptation triggered by feature repetitions? An unexpected finding

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For decades, cognitive adaptation to response conflict has been considered to be the hallmark of cognitive control. Notwithstanding a vast amount of evidence ruling out low-level interpretations of these findings, disbelief still exists with regard to the underlying cause of the observed effects. Especially when considering cognitive adaptation to unconscious conflict, it is still a matter of debate whether repetitions of features between trials might explain this intriguing finding rather than the involvement of unconscious control. To this purpose, we conducted two masked priming experiments in which four different responses to four different stimuli were required. This allowed us to completely eliminate repetitions of prime and target over consecutive trials. Independent of whether conflicting information was presented clearly visible or almost imperceptible, the results showed an unexpected pattern. Contrary to the regular congruency sequence effect (CSE) (i.e., classic Gratton effect), in both experiments the congruency effect increased following incongruent trials. Interestingly, this reversed effect completely disappeared when we eliminated all trials with feature repetitions from the analysis. A third experiment, in which feature repetitions were excluded a priori, showed a small but regular CSE in the error rates only. Given that feature repetitions are theoretically thought to create a regular CSE, our results are not in line with an interpretation in terms of feature repetitions nor with an interpretation in terms of cognitive control. We conclude that examining cognitive adaptation with or without feature repetitions might be more difficult to conceive than is often suggested in the literature.

Poster Presentation   **Session C**

Haptic and auditory steady-state responses as markers of cortical arousal - an exploratory study

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Among many proposed hypotheses about the neural correlates of consciousness, integration of information is the one raising special scientific interest. Additionally, reliable distinction between different conscious states remains desirable for patients after severe brain damage who may not be able to move or communicate while retaining the capacity for conscious processing. In this study we tested auditory and haptic steady-state potentials evoked by a broad range of modulation frequencies in both modalities as a potential indicators of actual cortical state denoting consciousness. In the somatosensory stimulation pilot study, 21 healthy participants were exposed to somatosensory stimuli, both while being awake and in deep NREM sleep. Somatosensory electric stimulation consisted of 60Hz and 62.5Hz carrier wave box-car modulated within broad range from 6Hz to 25 Hz. Brain activity was measured with 32-channel EEG. We observed lower amplitudes of somatosensory steady-state responses for 12, 20 and 25 Hz modulation frequencies in NREM sleep as compared to wakefulness. In the auditory paradigm 18 subjects received auditory periodic stimuli (carrier frequency 1000 Hz) which were modulated by the set of amplitude modulated frequencies: 4Hz, 6Hz 8Hz, 12Hz, 20Hz, 40Hz. At the same time, in two experimental states: wakefulness and deep NREM sleep brain activity was monitored with 64- channels EEG. Analysis revealed that amplitudes (calculated with F-test) and phase variability (with phase coherence - PC index) were significantly lower in sleep compared to wake condition for 4Hz, 6Hz, 8Hz and 40Hz. However only PC values for 6Hz and 8Hz could be considered for distinction between states on single subject level. Our results suggest that the parameters of steady-state evoked responses in both studied modalities are sensitive to the level of cortical arousal (when contrasting NREM sleep and wakefulness), and thus can be treated as a tool of assessment of integrative neuronal activity underlying conscious processing.

Poster Presentation　　　　　　　　　　　　　　**Session C**

Is processing of focal colors more automatic?

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Contemporary research on color naming is an interdisciplinary project involving various methods and results of many different disciplines such as philosophy, linguistics, cognitive science of perception, experimental psychology, culture studies or even logic. According to the most influential work of Berlin and Kay the most basic and fundamental structure of color naming is fixed by genetically determined physiology and common for all human cultures. Rosch has developed their theory with an idea that that so-called focal colors, (i.e, most representative examples, prototypes) serve as cognitive reference points for color categories, relative to which other colors are learned, categorized, and encoded in memory. We tried to investigate this hypothesis using empirical methods od cognitive psychology. Our study aims to determine whether the use of prototypical color font facilitates automatic processing of the color term. We utilize reverse Stroop task, which requires selective attention for the target word (color term), with font color being ignored. We manipulated the hues of six colors in order to develop three experimental conditions: congruent (color term printed in corresponding focal color), less congruent (color term printed with corresponding color, but not a focal one) and incongruent (font color did not match the displayed color term). Previous studies of Smithson et al. have shown that the transition from the facilitation to interference (measured in reaction times) correlates to manipulation of the distracting font color from congruent to incongruent. Our hypothesis was that there will be statistically significant difference in the reaction times between congruent and less congruent conditions. Even though ANOVA analysis of variance indicated existence of significant differences between all three conditions, post-hoc analysis did not confirm those results. Nevertheless, we observed the reverse Stroop effect for two pairs of conditions: congruent-incongruent and less congruent-incongruent.

Poster Presentation

Cross-modal bottom-up capture fails for subliminal visual events

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Many studies support bottom-up cross-modal integration resulting in automatic signal enhancement. Remarkably, several studies have shown cross-modal integration even when visual stimuli are suppressed from awareness, in binocular rivalry. However, these findings often result from top-down regulation. An important question is, therefore, if purely bottom-up cross-modal integration can break through the awareness threshold. We measured perceptual flips in a binocular rivalry paradigm after uninformative sounds or abrupt visual events appearing on the suppressed or the dominant percept. Flashes and sounds occurred unpredictably and in an uncorrelated fashion, sometimes occurring together. Interestingly, a flash on the suppressed eye induced a faster switch when coinciding with a sound than the flash or the sound per se. Yet, contrary to the idea of cross-modal integration, the faster flips induced by bimodal stimuli were well predicted by a probability summation model assuming independent contributions of vision and sound. In a follow-up experiment we aimed at addressing whether attention capture independently exerted by each sensory component of the bimodal event was sufficient to explain this effect. To do so, we replaced the sounds with gaps of silence embedded in broadband continuous white noise, thus voiding bimodal events from crossmodal coincidence but rendering them equally salient in terms of attention. Similar to the other experiment flips were faster when flashes to the suppressed eye coincided with sound gaps, compared to unisensory transients by their own (i.e. silent gap or flash). Again, this effect was well accounted for by a probability summation model. Thus, we conclude that despite bimodal events result in 'rescue' of visual subliminal stimuli to awareness, this is not a consequence of bottom-up cross-modal integration. Instead, the results favor the interpretation of independent contributions of bottom-up transient events, both contributing to the alternation in conscious percept.

Poster Presentation

The effect of sleep on the consolidation of a novel artificial langauge

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Consolidation refers to the progressive post-acquisition establishment of long-term memory, a generative process that can result in additional, delayed, "offline" performance gains. In some tasks, notably movement sequence learning, sleep may be necessary to complete the process of consolidation, and specifically the expression of "off-line" gains. Here, we tested whether the acquisition of linguistic knowledge benefits from post-training sleep; i.e., whether a night's sleep affects the consolidation process after practice with a novel artificial language. Adult university students learned a miniature artificial language, Brocanto3, in a lab setting, in the context of a novel board-game. Participants completed a first training and immediate test session, and a second test session 10-12 hours later. Performance was compared across two groups-conditions – half of the participants completed the 1st session, in the morning and then were retested in a 2nd in the evening (Nosleep). The other group completed the the1st session in the evening and the 2nd session after a night's sleep (Sleep). Long term retention was tested 10-14 days later in all participants. The Sleep group showed significant "offline" improvements in both comprehension (grammaticality judgements) and production (describing game moves) of Brocanto3 phrases; RT in the former and production time in the latter task were reduced by 48% and 20%, respectively, with no cost in accuracy. The No-sleep group showed a smaller improvement in the comprehension test (33%) and no improvement in the production test (-5%). There was good retention in both groups. These preliminary data suggest that sleep might play a role in enhancing processes underlying procedural memory consolidation triggered by the learning of a new language in young adults. Further, sleep may be necessary specifically in supporting consolidation processes in language production.

Poster Presentation

Evidence for context driven updating of task-set representations in working memory: The informed fadeout effect

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Evidence for context driven updating of task-set representations in working memory: The informed fadeout effect Maayan Pereg and Nachshon Meiran Working memory content can be updated rapidly and efficiently in order to maximize performance in cognitive tasks. A few explanations have been suggested to account for preparatory mechanisms underlying this ability. This study was meant to explore working memory updating at the level of the plausible task-sets held for upcoming performance through context updating – a rapid online change in control demands, tested employing the task switching paradigm. Previous research suggested there is a "fadeout effect" when moving from a task-switching to single-task performance (Mayr & Liebscher, European Journal of Cognitive Psychology, 2001), indicating gradual improvement in performance as soon as one task is declared to be no-longer relevant, yet this effect could reflect passive learning rather than intentional control. The current study presents the "informed fadeout paradigm", in which one of two tasks is canceled for a certain number of trials and participants are sometimes informed and sometimes uninformed regarding this cancellation. The "informed fadeout effect" reflects the fact that participants performed better in the informed fadeout condition than in the uninformed fadeout condition, but only after one informed trial had been performed. In addition, this trend was more prominent when the informed fadeout appeared at the end of the experimental block. These results support a "retroactive adjustment" intentional control, which maximizes performance as a function of the current system's state.

Poster Presentation

The role of the prefrontal cortex in explicit sequence learning and consolidation: Evidence from a transcranial direct current stimulation study

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Recognizing sequential regularities of the environment underlies motor, cognitive and social skill acquisition, and is essential for predictive behavior and decision making. This process can occur with or without awareness. One of the most important challenges is to understand how sequence learning occurs and how the acquired information consolidates and stabilizes in the brain. Evidence suggests the critical role of the prefrontal cortex (PFC) in these processes and a functional asymmetry between the two hemispheres has been shown in implicit sequence learning. The aim of the current study was to investigate how awareness modifies functional asymmetry of the PFC in sequence learning and consolidation. Healthy young adults participated in the experiment. Anodal transcranial direct current stimulation (tDCS) over the right or left dorsolateral PFC (DLPFC) was applied during an explicit probabilistic sequence learning task in order to enhance neural excitability in the stimulated brain regions. To examine how brain stimulation affects time- and sleep-dependent consolidation of the acquired sequential information, we used AM-PM vs. PM-AM design and compared experimental groups who did or did not have sleep in the 12 hour retention period. To our knowledge no study has investigated the role of PFCs in explicit sequence learning using brain stimulation yet. Our results suggest that tDCS has no effect on sequence learning during the stimulation period; however, it has an asymmetric effect on consolidation when applied on different hemispheres. Our findings can lead to a deeper understanding of the role of the fronto-striatal networks in sequence learning and consolidation, and highlight a functional hemispheric asymmetry of the PFC in these processes.

Poster Presentation

Changes of functional connectivity during implicit sequence learning

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Sequence learning is a significant component of skill learning, which is involved in obtaining motor, cognitive as well as social skills. However, the neural basis of the formation of this fundamental learning mechanism still remains poorly understood. The present study aimed to investigate 1) the functional connectivity (FC) networks which promote successful implicit sequence memory formation 2) and the dynamical changes of network connectivity during learning. Young adults (N = 28) performed the Alternating Serial Reaction Time (ASRT) task while 128 channel EEG recording was performed. ASRT measures two aspects of learning, namely general skill and sequence-specific learning. During the first, second, and third part of the learning task, phase synchronization in 7 frequency bands was used to quantify FC between cortical regions. According to the results of linear regression analysis, the sequence-specific learning performance was associated with an increase of FC in the posterior brain regions exclusively mediated by fast brain oscillations (beta) together with a decrease of FC in the frontal network driven by slow oscillations (theta, delta). In line with this result, a prominent decline of FC in slow oscillatory networks together with an increase of FC in fast oscillatory network was observed as a function of time elapse. Our results indicate that implicit learning processes are provided by fast oscillation in posterior cortices, and reduced slow rhythms in the frontal network that are linked with attentional monitoring. In conclusion, a dynamic antagonist relationship between the brain networks of automatic and controlled processes may serve as a hallmark of implicit sequence learning.

Poster Presentation   **Session C**

Is a picture worth a thousand words? The effect of encoding, misinformation and test formats on susceptibility to memory distortions

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The encoding specificity hypothesis predicts that congruence between encoding and test phases should lead to fewer memory errors. The present studies examined whether the format of original information, misleading information or test influence the level of false memory. In Experiment 1, the susceptibility to misinformation was verbally tested after encoding original information in one of four different formats: as a film, slides, and as a written or auditory narrative. The results revealed that pictorial encoding of original information (a video or slides) increased the probability of accepting verbally suggested misleading information which might be a consequence of encoding-retrieval format match. This effect was partially confirmed in Experiment 2, where either verbal or pictorial modality was utilized during encoding, post-event information (PEI) and test (fully crossed design). However, auditory presentation of original or PEI modified the effect, showing the strongest memory trace created following auditory description.

Poster Presentation

Sleep fragmentation may impact memory consolidation in narcoleptic hildren

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Memory consolidation processes mainly occur during sleep in adults as in children. Two key features of narcolepsy are short paradoxical sleep latency and an important sleep fragmentation. This study aims at determining whether sleep-dependent memory consolidation processes are affected in narcoleptic children. To challenge this question, 10 narcoleptic children (NC) and 10 healthy control children (CONT), matched with age and gender, were evaluated using an episodic memory test (2D location task) resembling the game "concentration". One hour before sleep, all children performed a learning session, until reaching a criterion of 75% of correct answers. Then, in the next morning, one hour after waking, children were retested on the same material during a recall session. Memory retention was determined by the difference in performances obtained during recall and learning session. A polysomnographic recording was performed during the night separating the 2 sessions in all children. No difference of performances between NC and CONT children was found during the learning session. However memory retention scores of NC children were significantly lower compared to CONT children (NC = -10%, CONT = 3.2%, $p < 0.05$) highlighting that while healthy children benefited from an enhancing effect of their sleep on retention, NC did not. A loss of information was observed after sleeping in NC children. Moreover, in addition to significantly higher sleep fragmentation found in NC children, the Total Sleep Time (TST) as well as the amount of light slow wave sleep (S2%) were significantly lower in NC children than in CONT children (TST NC = 473min, TST CONT = 524min, $p < 0.05$; S2% NC = 36.3%, S2% CONT = 46.7%, $p < 0.05$). Our results suggest that sleep pattern of narcoleptic children may have an impact on sleepdependent memory consolidation. The implication of such difficulties in lower academic performances frequently reported in these children should be evaluated.

Poster Presentation

They keep on lurking - how we underestimate the impact of response-effect associations

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Flexible goal-directed behavior rests on the aibility to rapidly extract the contingencies between responses (R) to certain stimuli (S) and the ensuing effects (E). In fact, less than ten encounters are needed to form such (S-)R-E associations, even if rather arbitrary. However, little is known on how long these rapidly acquired associations continue to affect behavior. On a more long-term scale, the associations might be overwritten when new S-R associations are learnt, especially when responses are no longer followed by effects. On a more short-term scale, S-R bindings and between-trial conflict adaptation effects might outrace or override the R-E associations. In the present study, participants performed several bi-phasic experimental blocks, where they first learned R-E associations while responding according to a novel S-R rule. In the second phase they responded to these previous response effects in a manner that was either compatible or incompatible with the acquired R-E association. In order to probe the stability of these associations, the test-phase was substantially longer than the learning-phase and response effects were presented in the test phase in only one of two groups of participants, thus preventing or enabling extinction learning. Overall, the results seem to suggest that rapidly learnt R-E associations cease to affect behavior under extinction rather quickly. However, short-term SR bindings can prevent the behavioral expression of learnt R-E associations in extinction and more dramatically, a Gratton-effect suggests that conflict adaptation prevents the behavioral expression of R-E associations even when they are still reinforced. When neither short-term mechanism is possible, a strikingly more stable impact of rapid R-E associations on behavior was revealed. Thus the present study strongly suggests that rapidly acquired response-effect associations are of substantial durability, and offers an explanation for the discrepancy in findings on the actual impact of response-effect associations on overt behavior.

Poster Presentation

Combination of MMSE and MoCA tests as a diagnostic screening tool

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In old age psychiatry, it is desirable to quickly predict the underlying cause of low scores on cognitive screening tests. Excising screening tools are poor predictors of underlying cause.

Can a combination of established screening tools (MMSE and MoCA) give better prediction in differencing between causes of cognitive decline?

The purpose of the study was to investigate if a combination of subtests within existing screening tools may facilitate better prediction of the cause of poor performance on cognitive screening tests. patients were tested with MMSE and MoCA at admission, and later grouped according to diagnosis at discharge. 122 patients fitted into main diagnostic groups, Alzheimer (14), Other Dementia (13), Schizophrenia (9), Delusional (7), manic (29), Bipolar (10), MDD (25), GAD (15). Group results on subtests of MMSE/MoCA were analysed with Anovas corrected for age, sex and education.

The Alzheimer patients had severe problems with all the subtests; several patients could not complete the tests, particularly not the MoCA test. The "other dementia" group had severe problems with most subtests, particularly MMSE Orientation, MMSE Figure Drawing, MoCA Visuo-cognitve test, MoCA Clock drawing, MoCA Abstraction and Orientation. The Schizophrenia group had problems attending to the tests, and the results are generally not valid for this group. The other groups showed patterns of poorer and better performances than the average patients on several subtests of MMSE and MoCA.

The Mini-Mental State Exam (MMSE) and the Montreal Cognitive Assessment (MOCA) are two diagnostic tests that both are used for screening purposes when there is a suspicion of cognitive problems. Our preliminary results shows that a combination of MMSE and MoCa subtests give a better prediction towards a particular diagnosis than MMSE or MoCA separately.

Poster Presentation

Decline in cognitive functions in elderly early-stage breast cancer patients after adjuvant treatment

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Cognitive deficits have been reported among patients receiving chemotherapy for cancer. The impact of chemotherapy on cognition among elderly patients has received little attention although they are more prone to presenting age-related cognitive deficits and/or cognitive decline during chemotherapy. This prospective study assessed cognitive functions in elderly patients treated for early-stage breast cancer (EBC). Participants were newly diagnosed EBC patients ≥65 years without prior systemic treatment, neurological or psychiatric disease and matched healthy controls. They had two assessments: before starting adjuvant therapy and after the end of chemotherapy (including doxorubicin
receive chemotherapy ("RT group", n=61), and at the same interval for healthy controls (n=62). Episodic memory, working memory, executive functions, processing speed, cognitive complaints, anxiety, depression and fatigue assessments were performed. Neuropsychological data were analyzed with a practice effect adjusted Reliable Change Index. Forty-nine percent of patients (mean age 70
working memory (25% of patients). Among these patients, 64% developed cognitive impairment after adjuvant treatment. Comorbidity and cancer stage were not associated with cognitive decline. No significant difference in objective cognitive decline was found between the two groups of patients, but the CT group had more cognitive complaints after treatment (p=0.008). Furthermore, in the CT group, the oldest patients [70-81] tended to have more decline with docetaxel (p=0.05). This is the largest prospective study assessing cognitive functions in elderly EBC patients including a group of patients treated with modern chemotherapy regimens and a group of healthy controls. Whatever the adjuvant treatment, about half of the patients had cognitive decline after adjuvant treatment. The oldest patients were more likely to have cognitive decline with chemotherapy, particularly with docetaxel.

Poster Presentation

Validation of the OTDL-G: the Greek version of the Observed Tasks of Daily Living – Revised

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The augmented representation of seniors in the general population has stimulated the discussion around the ability to live independently for as long as possible. The assessment of one's independent living ability, or else everyday functionality, relies on measures of activities of daily living (ADL). Several measures in this regard have been developed, though their universal use is not feasible. More precise, ADL measures have to be culturally adapted in order to reflect seniors' everyday life in the local level. This study was set out to translate, culturally adapt, and validate the Greek version of the Observed Tasks of Daily Living-Revised (OTDL-R), using a sample of 104 neuropsychologically intact seniors. The OTDL-R was culturally adapted, using the guidelines of Chesner (2010). The resulting measure (OTDL-G) showed a good internal consistency (α = .641) and had a desirable range of difficulty. The OTDL-G correlated significantly with a variety of cognitive measures, as well as with age, education, and income. Regression analysis revealed that scores in the OTDLG were independently predicted from memory, age, education, and income. Lastly, a Structural Equation Modelling analysis showed a good fit of the data to the one-factor model. It was concluded that the OTDL-G is a valid and reliable measure of everyday functionality for Greek older adults, for research purposes.

Poster Presentation

Graphical Network Analysis on Verbal Fluency Data

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In a semantic fluency task, participants are required to give as many exemplars from a category (animals or fruit/vegetables) as possible within a set amount of time. The task has been used successfully as a predictor of dementia-related cognitive decline. Recent theoretical developments have addressed the semantic fluency task as a search task, where search processes operate on a semantic network. To date, only a handful of reports have applied a graphical network analysis on verbal fluency data, but none have combined this approach with the semantic search processes. Here we apply network analysis on real data to address individual differences in fluency performance, which can readily be employed in longitudinal cohort studies. To show the utility of network analyses in longitudinal work, we construct a computational model that generates fluency data and the relation between search processes and memory structure on the network that is inferred from the resulting behaviour.

Poster Presentation

Object and Face Naming in Elderly: Proper Name Specific Impairment in Inhibitory Processes

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Aging has traditionally been related to impairments in name retrieval. These impairments have been traditionally explained by a phonological transmission deficit hypothesis or by an inhibitory deficit hypothesis. This study analyzed the possible role of these approaches in explaining both object and face naming impairments during aging. Sixteen older adults with low educational level (Mean age = 68.6; Mean years of education = 4.3), 16 older adults with high educational level (Mean age = 66.4; Mean years of education = 15.6) and 16 young adults with high educational level (Mean age = 19.3; Mean years of education = 17.3) were asked to repeatedly name objects or famous people using the semantic blocking paradigm. We compared naming when exemplars were presented in a semantically homogeneous or heterogeneous context. Data revealed a significant slowing for both face- and object-naming in the homogeneous context, with a stronger effect for face naming. Interestingly, the group of older adults with low educational level showed an increased semantic interference effect during face naming. These findings suggest that this group of older adults is more vulnerable to interference effects, possibly because of their difficulties suppressing competing proper names. These results would support the proposal of a deficit in inhibitory processes in aging, affecting specifically proper name retrieval in the high interference context.

Poster Presentation Session C

Visual statistical learning in infancy: revisiting Kirkham et al. (2002)

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Statistical learning in infants has become a major topic in cognitive science and has been claimed to be crucial for the survival of organisms. For instance, infants are already sensitive to auditory patterns of covariation at eight months (Saffran et al. 1996) and this ability might be a prerequisite of the first language acquisition. Accordingly, Kirkham et al. (2002) showed that these results could be generalized to the visual domain. In their experiment, in a habituation phase infants were randomly exposed to 3 pairs of colored shapes (a pair consisting of the sequential presentation of 2 shapes). After a fixed habituation criterion, a test phase started consisting of 6 trials: 3 familiar vs. 3 novel sequences of pairs. Kirkham et al. 's results showed a preference to the novel sequences. The aim of the present study is to identify what infants of 8 month-old learn in that situation (i.e., the entire sequence or the association between shapes). In our experiment, the habituation phase was exactly the same as in Kirkham et al. (2002). However, the main difference in test phase was that on each trial only 1 single pair was presented repeatedly. On familiar trials, the test pairs were identical to the training pairs. On novel trials, the test pairs were composed of the same shapes but in an untrained order. Preliminary results, unlike Kirkham et al. (2002) and Saffran et al. (1996), revealed a familiarity preference: participants looked longer at familiar than at novel test trials, indicating that infants learned pairwise regularities. Results will be discussed at the conference.

Poster Presentation

Complex problem solving and its relation to verbal and nonverbal abilities

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Problem solving skills are crucial in modern environment but it is still unclear which cognitive abilities and to what extent are underlying these skills. It is important to understand and analyze what kind of skills and abilities should be promoted in schools to foster students' ability to deal with everyday and complex problems they might encounter. Aims of this study were: 1) to assess Complex Problem Solving Skills (CPS) and Cognitive Abilities of high-school students aged 16 to 18; and 2) to test which cognitive abilities (verbal, nonverbal abilities or working memory) can better predict performance on Complex Problem Solving test. 130 high school students with mean age M=17.20 (SD=.95) participated in this study, 83 of them were female. Participants completed several cognitive abilities tests that were created originally for this study: Verbal analogies test, Quantitative reasoning test, and Working memory test. Participants also completed Standard Progressive Raven matrices test and computerized CPS test MicroFIN. Results show that both Verbal and Nonverbal reasoning is significantly related to two CPS dimensions – Knowledge acquisition and Knowledge application – and to total score of CPS. Interestingly, results also show that Working memory is only significantly related to CPS dimension Knowledge application and total score, in contradiction to what was expected. These results give understanding of which cognitive abilities are important to effectively solve problems.

Poster Presentation

Effect of automatic tool time efficiency influence on frequency-of-use

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It is known that humans tend to minimize effort in a wide range of professional and personal activities. To do so humans frequently use a variety of tools that improve our physical and cognitive capabilities. In modern societies tools have become more and more sophisticated, some of these tools, hereafter referred as automatic tools, completely free us from the task. Delegating the task to automatic tool frees time for other activities. But it is also known that humans tend to avoid idleness by getting engaged in different activities. In some situations, these two human trends (effort minimization and idleness) can be considered as competing the one with the other. Our purpose was to investigate the influence of the waiting time (i.e. automatic tool task completion time) as compared to a fixed manual task completion on people preference toward waiting or doing the task. In order to do so, in two experiments participants had to choose between a manual performance of a task or an automatic tool performing the task for them and resulting in waiting. The automatic tool time efficiency was controlled. In its less efficient version the automatic tool task completion time was equal to the time needed for manual completion whereas in its most efficient version the automatic tool was much faster than a manual completion. The more time efficient the automatic tool is, the more frequently participants are using it. It must be mentioned however that participants did not use the automatic tool as soon as automation was more efficient than manual completion. Indeed participants only favoured automatic completion of the task over manual completion when the automatic tool was at least twice faster than manual performance. Therefore when the least effort and idleness avoidance principles are in competition people prioritize idleness avoidance over effort minimization.

Poster Presentation

Enhanced causal illusion: Bogus treatments may seem effective, but bogus treatments with no side effects seem even better

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Very often people prefer to use alternative medicines that have failed to prove effective in clinical trials, instead of scientifically validated treatments. We interpret this as an instance of the "causal illusion": the illusory belief that a potential cause and an outcome are causally related. This illusion can be understood as the result of a basic associative learning process. Based on this account, we predict that the frequency of usage of a treatment will affect the strength of the illusion. Thus, perceiving a medicine as "free from side-effects" may contribute to using it very frequently (since it is harmless), and therefore to strengthen the illusion that it is effective. In our experiment, two groups of participants were allowed to use a medicine to heal fictitious patients. The rate of spontaneous recovery of the patients was high, and noncontingent with the administration of the medicine. That is, the medicine was completely useless. The crucial manipulation was that, in one group, the medicine was described as producing severe side-effects, whereas in the other group the medicine had no side-effects. We found that perceiving the medicine as free from side-effects made participants use the medicine with high probability. As expected under the associative learning framework, the more often they used the medicine, the more likely they were to develop an illusory belief in its effectiveness. This behavior is similar to actual pseudomedicine usage: when a treatment is thought to be harmless (such as homeopathy), it is used with high frequency. This, in turn, produces the overestimation of its effectiveness in treating diseases with high rate of spontaneous relief (such as common cold). These results shed light on the motivations spurring the preference of pseudomedicines over scientific medicines, and show how they can be readily explained by current theories of associative learning.

Poster Presentation

Cognitive correlates of moral decision making

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As Joshua Green's dual process theory of moral judgment suggests, people use both emotions and reasoning while solving moral dilemmas. Emotions tend to lead them to intuitive, deontic decisions whereas reasoning supports calculative, utilitarian decisions. If so, the latter decisions should be related to the basic features of human cognitive apparatus (tools of reasoning). Fluid intelligence, working memory capacity and cognitive control ability will be presented as possible cognitive factors relevant to the process of making moral decisions. Two hypotheses are stated. First, the cognitive abilities (IQ, WM, cognitive control) correlate with the tendency to make utilitarian rather than deontic moral decisions. Second, those abilities are related to decision time of utilitarian decisions but not of deontic ones. Participants will perform a set of cognitive tests and tasks (such as Raven Progressive Matrices and OSPAN) and then play a computer game designed to introduce two variants of the probably most studied moral dilemma i.e. Trolley Problem – Footbridge Dilemma and Switch Dilemma. The correlation coefficients between cognitive abilities on the one side and moral decision variables (decision type, decision time) on the other will be computed, presented and discussed from the perspective of the main theories of moral judgment.

Poster Presentation

Session C

The impact of habitual approach and avoid behavior on goal-directed actions

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To behave in a goal-directed manner essentially means to choose an action depending on its expected outcome given the current situational context. Habitual behavior, in contrast, is based on rather rigid stimulusresponse association often induced by overtraining. Importantly though, both behavioral tendencies are quite often present in one and the same situation. In the present study we aimed at investigating the acquisition of both habitual approach and avoidance behavior within-subject, the resolution of conflict between goal-directed actions and these habits as well as inter-individual differences that affect the ability to pursue goals in spite of competing habits. Therefore we comprised a novel experimental paradigm consisting of three consecutive phases. In a first phase, subjects acquire knowledge about the hierarchical relationships between responses to certain stimuli and the resulting outcomes. In a second phase specific responses towards a subset of stimuli are rewarded or punished, allowing the investigation of habitualization of both approach and avoidance behavior. After the second phase participants are explicitly informed that their responses are no longer rewarded or punished. Finally, in a third phase subjects are instructed to produce reward-unrelated outcomes in the presence of a certain stimulus while this goal-directed action can be either compatible or incompatible to the habitual response. The results indicate that the acquisition of approach behavior is delayed in some participants compared to avoidance behavior when both are acquired concurrently. However, after habitualization, goal-directed actions are similarly impaired by competing habitual approach and avoid tendencies. The amount of interference between goal-directed and habitual actions correlates with selfreported attentional impulsiveness. In conclusion, the results indicate approach and avoidance behavior differ mainly in their acquisition speed while they, once habitualized, exert the same amount of interference on competing goal-directed actions.

Poster Presentation

Cognitive capacity constraints on heuristics

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Heuristics are decision strategies which require low processing time because they ignore information in the decision environment; they are fast and frugal. However, not all heuristics show equivalent processing speed and frugality. Two heuristics, Tallying and Take-the-Best, were compared in their use of cognitive resources under time pressure. Tallying is less frugal than Take-the-Best since it takes into account all cues, whereas Take-the-Best only processes the best discriminating cue. Two hundred and six subjects were recruited in an online mixed design where subjects were asked to learn to use one of two heuristics, Tallying or Take-the- Best, applied in a seven cue environment. Subjects learned the rule during a practice phase and were subsequently asked to apply the rule in a self-paced phase and a phase that enforced a response time deadline. In accordance with our hypothesis, performance was not affected by the time pressure manipulation in the Tallying condition but it did hurt performance significantly for Take-the-Best. The deadline affected trials differentially depending on the level of trial difficulty; where trial difficulty was defined as the level of depth in serial search for cues in the Take-the-Best condition or the total difference in cue values for the Tallying condition. The results are interpreted as a consequence of the difference in the serial processing nature of a strategy like Take-the-Best and the holistic processing character of Tallying.

Poster Presentation

Long-term stability of process scores in the French WISC-IV

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In order to provide clinicians with a more thorough understanding of child's performance on Block Design, Digit Span and Cancellation, seven process scores are included in the Wechsler Intelligence Scale for Children-Four edition (WISC-IV): Block Design No Time Bonus (BDN), Digit Span Forward (DSF), Digit Span Backward (DSB), Longest Digit Span Forward (LDSF), and Longest Digit Span Backward (LDSB). For relevance of prognostic statements, it is essential to rely on test scores that are stable across time. The goal of this study was to explore the long-term stability of the WISC-IV process scores (BDN, DSF, DSB, LDSF, and LDSB).

The sample consisted of 277 nonclinical French-speaking Swiss children aged between 7 and 12 years (at first testing: mean age = 8.87 and SD = 0.82; at second testing: mean age=10.64 and SD = 1.11). The WISCIV were administered twice in an average test-retest interval of 1.77 years (SD = 0.56). Stability coefficients of process scores ranged from .29 on LDSB to .66 on BDN. At individual level, less than 45% of children had their process scores within a confident interval of ±2 SEM between the two assessments. Our findings suggested that the process scores were not stable in long-term. Caution should be exercised in the interpretation of these process scores. It is not recommended to use them for individual predictions.

Poster Presentation

Effects of intention value on prospective memory

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In everyday life, our motivation to fulfil delayed intentions is presumably related to the value attached to those intentions. However, the field of prospective memory research has rarely examined the effect of value on the likelihood of fulfilling intentions. In the present study, participants performed a task in which each trial involved a pair of delayed intentions, each of which was associated with a high (£0.10) or low (£0.01) monetary incentive. Experiment 1 (N=16) showed that participants were more likely to fulfil intentions when there was a higher value attached. Experiment 2 (N=84) extended this finding in a 2x2 design examining two factors. The first factor was Gain/Loss: in the Gain condition participants received a reward for fulfilling intentions, whereas in the Loss condition participants were given an initial monetary reward and incurred deductions when they failed to realise intentions. The second factor was Self/Other: in the Self condition participants earned rewards for themselves, but in the Other condition participants were paired and earned rewards for each other. Results in the Gain-Self condition replicated Experiment 1. Furthermore, results indicated a significant Gain/Loss x Self/Other interaction, such that the value attached to intentions influenced their likelihood of fulfilment in a manner that differed between conditions. Real-world intentions vary according to whether they have an associated reward when they are fulfilled, or an associated penalty when they are not, and also according to whether they are performed for oneself or for another person (e.g. collaborating with colleagues). The present results indicate the importance of considering these factors in order to understand motivational influences on prospective remembering.

Poster Presentation

The emotional impact of being myself: Emotions and foreign language processing

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Self-related stimuli enhance performance by boosting memory, speed and accuracy as compared to stimuli unrelated to the self. This gives rise to the self-bias effect, whose robustness has been demonstrated in several recent studies. We aimed to investigate the extent to which this effect depends on the language context, by comparing self-biases in a native and a foreign language, given that recent evidence suggests that foreign language contexts impose a relative emotional and psychological distance in nonnative non-balanced bilinguals. Two experiments were conducted with native Spanish speakers with a high level of English proficiency in which they were asked to complete a perceptual matching task where they associated simple geometric shapes (circles, squares and triangles) with the labels "you", "friend" and "other" either in their native or foreign language. Results showed a robust asymmetry in the self-bias in the native and foreign-language context: a larger self-bias was found in the native than in the foreign language. An additional control experiment demonstrated that the same materials administered to a group of native English speakers yielded robust selfbias effects that were comparable in magnitude to the ones obtained with the Spanish speakers when tested in their native language (but not in their foreign language). We suggest that the emotional distance evoked by the foreign language contexts caused these differential effects across language contexts. These results demonstrate that the foreign language effects are pervasive enough to affect automatic stages of emotional processing, and that they respond to highly adaptive mechanisms based on emotional reactivity.

Poster Presentation　　　　　　　　　　　　　　　**Session C**

Motivational approach and avoidance in autism spectrum disorder: A comparison between real photographs and cartoons

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Individuals with Autism Spectrum Disorder (ASD) show a lack of motivation to engage in spontaneous social encounters with other human beings. However, the basis for these diminished approach-related social behaviours is still unclear. This study aimed at investigating social motivation in ASD as measured by approach and avoidance processes. To do so, we used and approach-avoidance task. In particular, we presented a group of ASD and a group of neurotypical adolescents with a series of emotionally positive, negative, and neutral visual stimuli, comprised of real photographs and cartoons - a stimulus with incentive salience for individuals with ASD. Participants were asked to either push or pull a joystick in response to an emotionally independent feature of the stimuli (colour frame). Following the main task, participants also rated the stimuli for affective valence and arousal. Results showed a dissociation in motivational responses towards positive stimuli for the ASD group only: faster avoidance from positive real photographs, but greater approach to positive cartoons, while no differences were found between emotionally negative or neutral stimuli. By contrast, no differences between the groups were found for the self-reported affective ratings. In light of the social motivation hypothesis, these atypical motivational responses suggest a deficit in assigning reward to socio-emotional stimuli in adolescents with ASD.

Poster Presentation

Socio-emotional skills and homeostasis in mammals: the key role of heartbrain interactions

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The polyvagal theory describes specific neurobiological mechanisms underlying social behaviors and emotional processing in mammals. This theory focuses on the vagus nerve activity which connects the heart and the brain together. This nerve is divided in two distinct complexes. The ventral vagal complex is composed of the myelinated branch of the vagus nerve. The myelinated vagus nerve allows a fast conduction of neural information between the heart and the brain. Such a high frequency heart-brain connection leads to both a flexible activation of the organism depending on the metabolic needs and an important adaptability to the environment. This flexibility and this adaptability foster the maintenance of homeostasis. In mammals, the maintenance of homeostasis is likely to be functionally associated with the emergence of pro-social behaviors and emotional processing, enabling a shift in attention to other individuals. Several experimental works corroborate the polyvagal theory and attest to a significant role of the heart-brain connection in pro-social motives and emotion identification. Heart-brain connection is often assessed by measuring heart rate variability. Heart rate variability can be determined by a power spectral analysis of the variation of the heart beat-to-beat interval. More specifically, the high frequency component of heart rate variability is a good marker of the myelinated vagus nerve activity. Our first study shows that high frequency heart rate variability is positively associated with cooperation in a social dilemma. Our second work highlights that heart rate variability biofeedback can be used in order to increase high frequency heart rate variability. This suggests that the real-time visual feedback of heart rate variability could be efficient as a non-invasive and nonpharmacological tool to regulate the heart-brain connection and the socio-emotional skills associated. Our third and fourth experiments propose two experimental designs allowing to test whether heart rate variability biofeedback can improve socio-emotional skills.

Poster Presentation

Functional anatomical correlates of emotion processing associated with economic decision-making

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Although economic decision-making is commonly characterised as a purely rational phenomenon, recent studies suggest it can be influenced by a combination of emotions and rational thinking. To date, relatively little is known about the neural correlates of this process. Functional magnetic resonance imaging was used to investigate neural substrates of decision-making in the Prisoner's Dilemma under three partner-directed emotion conditions. Twenty participants were given emotional stimuli in the form of exchanging essays and evaluations with a (fictional) partner to induce sympathy, anger or a neutral emotional response towards these confederates and were subsequently scanned while making decisions to cooperate or defect against these partners in the Prisoner's Dilemma task. Our behavioural results showed that participants were most likely to defect against their partner after anger induction and least likely to defect after sympathy induction, with the neutral condition eliciting intermediate defection rates. Moreover, the sympathy condition elicited quicker responses for cooperation compared to defection choices, whereas this reaction time pattern was reversed in the anger and neutral conditions. The imaging data yielded increased left amygdala activity for the [sympathy (defection-cooperation) vs. neutral (defection-cooperation)] contrast. The percent signal change was higher during defection compared to cooperation trials in the sympathy condition, whereas this pattern was reversed in the neutral condition. The [anger (defection-cooperation) vs. neutral (defection-cooperation)] contrast showed decreased activity in the left putamen. The decrease was lower during cooperation compared to defection trials while in the neutral condition the percent signal change during cooperation and defection was similar. These findings indicate that emotion plays an important role in the decision-making process. While the left amygdala activation may be indicative of emotion processes associated with decisions towards a nonoptimal course of action, the left putamen suppression may help to overcome an emotion in order to make a more rational choice.

Poster Presentation

Early visual cortex responses to violations of emotion-location associations

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Over the last few years, evidence has accumulated that indicates active involvement of low-level sensory processing in higher cognitive functions. Some of the modulations of early visual processing in particular suggest that retinotopic visual cortex may be implementing active predictions of future events in the environment. In the present study, we tested this idea at the earliest stages of visual processing that can be reliably detected using scalp electroencephalography (EEG) in humans. Healthy participants implicitly learned to associate foveally presented images of human faces expressing different emotions with peripherally presented arrays of line-elements. Different emotions predicted peripheral stimuli in either the upper or the lower visual field on frequent standard trials. On infrequent test trials, emotional faces were followed by combined stimulation of upper and lower visual fields. Subtracting event-related potentials (ERPs) elicited by standard trials from those elicited in test trials allowed us to compare early visual cortex responses to the same physical stimulus elements under expected vs. unexpected conditions. We hypothesized early visual cortex responses to be increased for unexpected stimuli. Our results showed no such difference between the two conditions at the level of the retinotopic C1 component. Thus, our findings indicate that the violation of simple emotion-location associations does not have a pervasive effect on early visual processing. Interestingly, half of our subjects became spontaneously aware of emotion-location associations. Effects of explicitness are marginally significant at our current sample size, but may have affected sensitivity for detecting subtle differences between conditions. Future experiments will test whether more arousing emotional stimuli lead to involvement of low-level visual processing in detecting mismatches between expectations and perceptions.

Poster Presentation

Session C

The impact of chronic media multitasking on the performance on the memory tasks

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The growing importance of the Internet in everyday life leads more and more social scientists to take the "media multitasking" issue. Multitasking of the Internet users generates questions about the cognitive and social consequences of this phenomenon and the research tools that will allow to define them. Therefore, in the first part of this article we described the psychological perspective of multitasking phenomenon, in particular focusing on the cognitive process connected with multitasking. The second part of this text includes sociological reflection where multitasking is the result of social acceleration. What is more, we presented new data concerning multitasking and proposed empirical solutions, which enable us in grasping this phenomenon. In the first stage of the research we adapted Media Multitasking Frequency Questionnaire (first edition: Srivastava, 2010; adaptation: Popławska, Osowiecka, Kramarczyk, 2015). The questionnaire consists of 24 items. 14 items refer to traditional media (e.g. paper publications, television, radio) and 10 others to the Internet (e.g. Facebook, browsing the Internet, using e-mail). The study involved 110 participants. It turned out that the questionnaire differentiates those engaging in many activities and those engaging in a small amount of activity associated with the media. Additional effects are associated with greater intensity of media multitasking in group of women and youth. In the second stage of the research studies we are investigating if highmultitasking people differ in effectiveness within the group? The measured variables will be level of stress, characteristics of Y population (e.g. age, generation, frequency of social media use) and cognitive processes connected with effective implementing the memory tasks.

Poster Presentation

Infrahumanization or threat perception? Measuring racial discrimination by the visual search of faces

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Two kinds of explanations are involved in both experimental and theoretical works dealing with racial discrimination: infrahumanization and threat perception. These perspectives are not necessarily opposed but are often invoked separately in the literature. The aim of our studies was to understand if out-group members are automatically considered as a threat or as something less human than in-group members (infrahumanization hypothesis). Indeed, the infrahumanization is the fact to consider out-group members as less human than members who do belong to our group. We investigated the influence of beliefs on visual and attentional processes. More precisely, our aim was to determine how social beliefs and motives (social dominance orientation, right-wing authoritarianism and speciesism) could influence automatic perception and behaviour toward outgroup members. We particularly focused on the difference of in-group and out-group face detection. Infrahumanization is usually measured with the attribution of primary emotions (commonly shared by the in and out group) and secondary emotions (only attributed to the in-group). In order to provide an implicit measure of infrahumanization, and determine whether it begins as an automatic process, we used a visual search task. Faces from different ethnic groups and emotions have been displayed: Caucasian and North African, neutral and angry. A screen composed of neutral pictures was displayed to the participants and we asked them to detect as fast as they could if a face was present on the screen. We identified a difference of face perception depending on the race of the face and the beliefs of the participants. Participants with a high score of right-wing authoritarianism showed slower reaction times to detect neutral out-group vs. in-group faces. This suggests that out-group faces are less likely to catch attention among objects, compared to ingroup faces. This study allows to investigate infrahumanization as a bias in automatic perception.

Poster Presentation

Affective processing in highly proficient bilinguals: An ERP study

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Subjective reports of bilinguals suggest that the first language may be experienced as more emotional than languages acquired later. During the last decade, several experimental studies have investigated whether there are differences between the first (L1) and the second language (L2) in the processing of the affective content of words. Their results are not consistent: Whereas there is evidence suggesting that the effects of the emotional content on words' processing are stronger for L1 than for L2, other studies have failed to find any difference between L1 and L2 (see Caldwell-Harris, 2014 and Pavlenko, 2012, for overviews). Most research in this field has relied on behavioral measures and there are only two studied that have recorded event related potentials (ERPs) (Conrad, Recio, & Jacobs, 2011; Opitz & Degner, 2012). None of the above research has addressed the role that arousal has on the processing of emotional words by bilinguals. The aim of the present study was to investigate whether the affective processing of words in the two languages of a bilingual can be modulated by their arousal level. We tested highly proficient balanced Spanish-Catalan bilinguals in a lexical decision task in which Spanish and Catalan words were presented. Behavioral measures and ERPs were recorded. The experimental stimuli consisted of positive and neutral words. Among the positive words, the level of arousal was manipulated. Both behavioral and electrophysiological results reveal that words' valence (i.e., whether they are positive or negative) as well as their arousal affect word processing in the two languages of the bilingual.

Poster Presentation

How emotions modulate working memory capacity?

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Baddeley's model of Working Memory (WM) has a new component, the hedonic detector, a system that captures positive or negative representations of experiences and optimizes future choices of actions by individuals. This component seems to be regulated by emotional states, consequently mood induction could be a useful tool for understanding mood disorders. We developed a paradigm of mood induction, in order to investigate the relationship between WM capacity and emotions, such as happiness and sadness, in young adults. Participants were 83 undergraduate students that performed, under humour induction, WM tasks related with three WM components: phonological loop, visuospatial sketchpad, and central executive. The mood induction procedure was carried out with two types of stimuli: classical music or IAPS's images, which were balanced in time of exposition (60 seconds) and in valence (positive or negative); generating four group conditions: positive musics, negative musics, positive pictures, and negative pictures. Participants were randomly allocated to these groups and each participant was induced in the same condition in three occasions interposed with the 4 out 12 pseudo-random WM tasks. Self-report scales confirmed that the humour induction procedure was effective. No differences between visual or auditory inductions were observed. Nevertheless, worse performance in WM tasks was found after negative humour inductions in contrast with positive ones, which affected different WM components; such as sad experiences of everyday life disrupt the cognitive performance.

Poster Presentation

Validation of an open-source bio-monitor for measuring electrodermal activity

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A wide range of psychological research from the areas of attention and emotion to clinical research on biomarkers of different abnormal behavior applies various measures of electrodermal activity (EDA) as indicators of sympathetic activation. Activity increases in the presence of stressors or excitement, but cognitive and affective happenings also trigger responses in the form of a sudden rise in skin conductivity and a slower return to the basic level in a time window of 1-10 seconds. Computer based devices are designed to monitor and/or record these changes. Main goal of the present study was the validation of Obimon, a new open-source precision skin conductance measurement device designed to measure electrodermal activity in various situations. Electrodermal activity data was recorded simultaneously using two devices: Obimon (obimon.com) and Nexus-16 (Mind Media BV, The Netherlands). Electrodes were placed on the volar surfaces of the medial phalanges of the index and middle fingers, and on the thenar and hypothenar eminences of the right palm. A sampling rate of 8/sec was used, while 7 participants watched a 10-minute nature documentary. Results show high consistency of measurements with the two devices. We conclude that Obimon is a useful tool in psychological experiments. It is open-source; both the software and its hardware design have been fully disclosed to the scientific community. Its license is research friendly and allows any kind of modification or extension to suite special needs of scientific experiments. Its design has been motivated by the demand to enable precision EDA recording, time synchronization between many devices and to external stimuli as well. Battery life permits long autonomous measurements for several days and simultaneous monitoring of multiple devices is possible in real-time over a wireless connection from a mobile phone or the Internet. This work was supported by the Hungarian Scientific Research Fund (OTKA-K100845).

Poster Presentation

Multisensory experience of letters helps the spelling and reading acquisition in intellectual disabilities students: a comparative study

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Few students with Intellectual Disabilities (ID) have an orthographic level (32%) whereas 29,3 % do not read, 6,8 % have an logographic level and 31,9 % read at an alphabetic level (Ratz & Lenhard, 2013). The aim of this research was to evaluate the effect of phonological and multisensory letter knowledge training on reading and spelling performance with ID teenagers (ID; 16,5 years-old N=22), compared to a group of Typical Children matched on mental age (TC; 6,2 years-old; N=22). In each group, we compared two training conditions, which differed on the sensorimotor experience of the letter-shape (visual V vs visual-haptic VH). A classical design was used with a pre-test (t0), then the training sessions (5 sessions, 1 per week, 20 min per session) and a post-test (t1). Results revealed a specific profile at t0: score of TC groups was higher than ID groups (whatever the VH or V trainings), although mental age did not differ between groups. A positive effect of the two trainings was identified with the ID teenagers. At t1, the difference between the ID and TC groups did not differ any more after the VH training, whereas this difference persisted over time after the V training, suggesting that the haptic experience closes the gap between levels of ID and TC groups. Hence, the efficiency of an active touching of the letter-shape facilitates the learning of letter knowledge with ID subjects. Moreover, as other studies with typical children (e.g., Bara, et al., 2004) or at risk of difficulties (e.g., Labat, et al., in press), multisensory letter knowledge for ID students could be an interesting way to enhance the integration and activation of grapho-phonemic correspondences used in spelling and reading abilities.

Poster Presentation

What did you say? Clap with one hand or clap with your both hands": Action verbs comprehension is modulated by hand motor responses compatibility

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Work in cognitive neuroscience demonstrates many links between language and action. More precisely, some data suggest that the motor system is crucial for action verbs comprehension. This suggests that similar neural substrate where involved during action execution and during action comprehension described in verbal modality. We tested this idea using a behavioral go-no go paradigm during a French concrete vs abstract verbs categorization task. The concrete verbs were hand-related and were related to either unilateral bilateral action. Twenty-six French right-handed participants were instructed to manually respond when the presented word was concrete (i.e., go responses) using their right-dominant or their left-nondominant hand. We observed a significant interaction ($F(1,25) = 5,60$, $p < .05$, PRE =.18) between hand-related verbs (unilateral, bilateral) and hand response (right-dominant, left non-dominant),. More precisely unilateral hand-related verbs presentations (such as write) induced faster right-dominant hand response; while bilateral hand-related verbs presentation (such as clap) induced similar responses for both right-dominant and left-non dominant hand responses. This suggests that the meaning of action verbs is embedded in the motor representations. There would be a pre-activation of the related motor cortex during action verbs meaning access that could explain the facilitation observed for the unilateral-related action verbs with the right dominant hand.

Poster Presentation   **Session C**

Reading and writing direction effects on the aesthetic perception of photographs

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Does the habitual reading and writing direction (RWD) affect the aesthetic appreciation of visual art? Perez Gonzalez (2012) showed that 19th century Iranian and Spanish professional photographers manifest lateral biases linked to RWD in their compositions. The present study aimed to test whether the general public shows similar biases, and under what conditions. Photographies with left-to-right (L-R) and right-to-left (R-L) directionality were selected from Perez Gonzalez's collections and presented in both the original and mirror reversed forms to Spanish (L-R readers) and Moroccan (R-L readers) participants. In Experiment 1, participants rated each picture as to how aesthetically pleasing it was. The results showed no interactions with RWD. In Experiment 2, we presented each picture and its mirror version and asked the participants to choose which one they liked better. Now, clear biases linked to RWD arose. RWD does affect aesthetic impressions of photography in the general public, but only when people are paying attention to the lateral spatial dimension of the pictures.

Poster Presentation

Do professional mathematicians differ from controls in elementary numerical processing: Insights from magnitude classification task

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In the presented study we aimed at investigating whether professional mathematicians (advanced PhD students of mathematics) differ from matched controls (1) PhD students who use advanced math in their everyday work but are not mathematicians per se (2) PhD students in humanities and social sciences in elementary numerical processing. To address this question we used magnitude classification task. Participants were to decide (in a bimanual setting) whether one-digit number presented on the screen was smaller or larger than 5. The assignment of response keys was reversed in the mid of experiment. The data was analysed in order to estimate numerical distance effect and the SNARC (Spatial Numerical Association of Response Codes) effect. Distance effect refers to the phenomenon that time needed to compare numbers is related to difference in their magnitude. The time needed to compare increases with decreasing difference between numbers. The presence of numerical distance is considered to be an evidence for analogue magnitude representation. Furthermore, small magnitude numbers are responded faster on the left hand side, whereas large magnitude numbers are responded faster on right hand side (the SNARC effect). We found that mathematicians did not differ from other groups in the numerical distance effect. Null effect was confirmed by Bayesian analysis. More interestingly dissociations were found in the SNARC effect. The overall SNARC effect was not present. When number ranges 1-4 and 6-9 were analysed separately, most pronounced SNARC effect was found in Mathematicians group for small magnitude numbers. In general our results lend a support to the hypothesis that analogue magnitude representation (as indexed by numerical distance effect) may be dissociated from spatial mapping of numbers (as indexed by the SNARC effect).

Poster Presentation

Session C

Integration mechanism and memory efficiency

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The integration mechanism of the sensori-motor features of an event is the core of Actin, a multiple-traces fonctional memory model developped by Versace et al. (2009, 2014). With memory efficiency and the improvement of memory performance in mind, the functioning of the integration mechanism is investigated to better understand how the potential enhancements of an integration training could spread to other tasks. Are unimodal and cross-modal integration two separate mechanisms or the two sides of the same coin? Moreover, are two types of memory training based on the two types of integration going to induce discrepancies between the different types of mesures or are they both going to improve memory in general. 48 participants who were tested in two groups first performed two memory tasks establishing a baseline, then a training consisting of a Memory game and finally alternative versions of the first two memory tasks to mesure any improvements. The two groups were divided according to the type of training the participants were presented with. The first group was given a unimodal (only visual) memory training and the second a cross-modal (auditory and visual) memory training. Results showed that the group performing the unimodal training obtained significantly higher scores than the group performing the multimodal training in the part of the first task evaluating unimodal integration. However, no significant progress between pre-test and post-test was observed. Regarding the crossmodal score, neither a difference between groups nor any kind of progress were recorded. Nevertheless, participants training with the cross-modal Memory game showed significantly lower error rates and a progession through pre-test and post-test in the second task mesuring memory-conjunction errors indicating that somehow the cross-modal training helped participants to create associations more resistant to interference. These results tend to support the two distinct integration mechanisms hypothesis.

Poster Presentation

The shape of abstract words

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The literature on sound-shape correspondences, though compelling, has suffered for years of important methodological problems, chiefly the fact that both the images and the words were invented ad hoc. Recently, Flumini et al. (2014) used invented words (e.g., bouba/kiki) and pictures of real entities (i.e., artifacts/natural objects; animals/robots) to confirm the sound-shape correspondence effect with more ecological stimuli. They were also able to show a correspondence effect between names' sound and categories (i.e., animals more often named bouba; robots more often named kiki), thus a sound-meaning symbolism. Given the presence of this correspondence effect regarding conceptual aspects of the visual stimuli, a natural extension of such evidence would be using real words and invented spiky/roundy figures to look for a reciprocal shape-meaning symbolism. The present study aimed to test whether such an effect could be observed with respect to positive and negative abstract words (e.g., democracy/tyranny, love/hate, pleasure/disgust). In Experiment 1, participants were presented with Spanish positive/negative words and pseudowords in a roundy/spiky frame and were asked to perform a lexical decision. The results showed no interactions between valence and (frame) shape. In Experiment 2, participants were presented with the same set of words along with two pictures (one rounded, the other spiky) and explicitly asked to associate one of them with the word. In this case, the results showed a clear interaction between valence and shape (i.e., positive words were associated with rounded pictures, negative words with spiky pictures). This evidence confirms the possibility of a shape-meaning correspondence in the form of a "conceptual synesthesia", offering a basis to speculate about how the meanings of abstract words are grounded, and suggests that, once established, these associations are difficult to capture in online processing tasks.

Poster Presentation

Real-life addition and subtraction: violations of commutativity

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Laboratory-based studies (e.g., Shaki et al., 2015, Psychological Research) found that numerical cognition violates principles of arithmetic, such as commutativity (a+b=b+a) and identity (a=a). Here we investigated whether such violations also occur in real life behaviours. In Experiment 1 participants were instructed to give small (20%) or large (80%) pieces from two cylinders of play-doh, in counterbalanced orders. In Experiment 2 they were asked to take both 10% from one and 20% from the other cylinder, again in counterbalanced order. Experiment 3 asked participants to estimate durations of two consecutive waiting intervals of either 1+2 or 2+1 min by marking a line. Experiment 1 showed that a small amount is overestimated compared to the complement of the larger amount. Experiment 2 found that 10+20 is more than 20+10%. Experiment 3 replicated the results of the second experiment with duration estimates: 1+2min were mapped onto longer lines than 2+1min. Thus, quantitative features of real-life events (experienced amounts or durations) show similar order-dependent biases as do supposedly abstract number concepts -- the sequential nature of our experiences prevents perfect precision. Our findings of situation-specific knowledge representations support an embodied cognition framework in which similar experiential principles, such as anchoring and spatial congruency across domains, structure our conceptual representations.

Poster Presentation

Spatial compatibility interference effects: a double dissociation between two measures reveals two time-courses

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In spatial compatibility tasks, when the spatial location of a stimulus is irrelevant it nevertheless interferes when a response is required in a different spatial location. For example, response with a left key-press is slowed when the stimulus is presented to the right as compared to the left side of a computer screen. Previous work has shown that the spatial response interference declines rapidly. We confirm this result when using standard reaction time (RT) measures. However, when recording facial electromyography (EMG) to assess emotional responses to response competition, we discovered that in situations where response competition was not detected in RT nevertheless late emerging EMG effects were detected. This finding highlights the importance of converging methods to investigate visuomotor processes.

Poster Presentation

Facial mimicry and emotion consistency: Influences of prior memory and context

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Facial mimicry is thought to assist in relationships with others through empathy and communication. However, whether mimicry of facial emotions is automatic or is influenced by the context in which the emotion is observed is uncertain. Further, it is unknown if memory of the context and facial emotion affects later mimicry when no contextual information is present. Experiment 1 manipulated emotion consistency implicitly, where a face expressing smiles or frowns was irrelevant and to be ignored while participants categorised target scenes. Some faces expressed emotions consistent with the scene (e.g., smiling at a positive scene), while others were inconsistent (e.g., frowning at a positive scene). During this implicit learning task there was evidence for encoding of face-scene emotion consistency, with slower reaction times (RTs), a reduction in trust, and inhibited facial electromyography (EMG) for faces expressing incompatible emotions. However, in a later task where the faces were subsequently viewed expressing emotions, with no contextual information, mimicry of emotion was similar for consistent and inconsistent faces. Therefore prior memory of information regarding face-emotion consistency did not affect mimicry responses. In a second study consistency was manipulated explicitly: some faces expressed emotions consistently, such as a friend smiling at your good news and frowning at bad news. Other faces were inconsistent, such as an enemy frowning at your good news and smiling at your bad news (schadenfreude). In this latter explicit context mimicry was significantly reduced when subsequently viewing emotion inconsistent faces. We conclude that face mimicry is an automatic process that is nevertheless influenced by context, especially if the context is explicitly created.

Poster Presentation   **Session C**

CORDELEC a new mechanical analogy to learn electrocinetics

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Teaching electrocinetics has always faced the problem that the subject being taught is abstract. A solution to overcome this problem has been to use different analogies to compare electrocinetics with more concrete concepts. All the analogies used up to now helped the students to understand better some aspects of electrocinetics but led them to misconceive other aspects of it. Here we tested a new device, CORDELEC, which was conceived to create a mechanical analogy as close as possible to electrocinetics. It imitates a series circuit and is made of a string in a closed loop that is put into motion when pliers release it. The energy to put the string into motion comes from a weight hanging from a wire that has been wound round a pulley. The motion of the string mirrors the movement of the electrons inside an electric circuit, the speed of the string equals the intensity, the pliers imitate a switch, the pulley put in motion thanks to the falling weight (equivalent of the generator's strength) works like a generator by creating differences in string tension. Participants can also mimic the functioning of a resistance by pinching the string with their fingers and thus observing the slowing of the string and feeling the heath caused by the friction. In order to test the efficiency of the device, participants were divided into two groups: the first group attended a short training session with and the second group without the device. The oral description of electrocinetics made in both groups was similar. Participants were tested before, just after and one week after the session. The scores of the participants who attended the training with the device were twice as good as those who attended the training without it and changed their sequential to a systemic reasoning.

Poster Presentation

The non-conglomerate conceptual mappings between Time, Valence and Space and how a bad mood makes you look towards the past

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The first goal of the present study was to investigate whether various conceptual mappings sharing the same conceptual domains can be processed at the same time. The few studies addressing this issue did not come to conclusive results. The experimental design used here enabled the activation of three conceptual mappings at the same time (past-left/future-right, negative-left/positive-right and negative-past/positive-future). Participants had to make temporal or valence judgments with their left or right hand on negative or positive verbs conjugated to the past (e.g. "he cried") or to the future ("she will smile"). Our results showed that the three conceptual mappings were activated at the same time, but processed in parallel: the processing of one conceptual mapping did not interfere with the processing of the other mapping, even if they shared a conceptual domain. The second goal was to test whether the processing of time, valence and space was modulated by participants' mood. Participants' mood was evaluated with the HAD questionnaire and their score was used to run the correlation analyses. Surprisingly, only the processing of time was modulated by participants' mood, the more depressive participants showing a bias towards the past. Interestingly, this bias changed towards the future after a Mindfulness induction. Implications of the present results for theories in the field of conceptual mappings and possible applications to clinical psychology are discussed.

Poster Presentation

Mind context: The dishonest mind set in sequence

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Responding honestly or dishonestly to questions can be defined as two distinct mental sets as the responder has to engage in distinct processing to act accordingly. This assumption is supported by the observation ofdistinct behavioral signatures of honest and dishonest responding, as for instance prolonged dishonest responses. Such observations indicate that honest responses are automatically activated and have to be inhibited to give way for the dishonest response. This difference in processing also triggers aftereffects on subsequent honest and dishonest trials, i.e., robust switch costs in response times and error rates when intentions switch from one trial to the next. In the current study, participants were placed in an experimental scenario in which they performed several tasks alone in a room. Afterwards, they had to answer critical questions about the scenario, as well as control questions about unrelated activities. Crucially, they were instructed to obscure the activities of the scenario. Thus, they had to answer critical questions dishonestly but control questions honestly. Thereby, sequential effects of honest and dishonest responding to simple yes/no questions could be examined in a design that most closely resembles a criminal context. The results provide a first glimpse on the potential of sequential modulation as a cue for lie detection.

Poster Presentation   **Session C**

Selfie posting behaviors are associated with narcissism among men

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Although many studies have investigated individual differences in online social networking, few have examined the recent and rapidly popularized social phenomenon of the "selfie" (a self-portrait photograph of oneself). In two studies with a pooled sample of 1296 men and women, we tested the prediction that individuals who score high on four narcissism sub-scales (Self-sufficiency, Vanity, Leadership, and Admiration Demand) will be more likely to post selfies to social media sites than will individuals who exhibit low narcissism. We examined three categories of selfies: own selfies; selfies with a romantic partner; and group selfies, controlling for non-selfie photographs. Women posted more selfies of all types than did men. However, women's selfie-posting behavior was generally unrelated to their narcissism scores. In contrast, men's overall narcissism scores positively predicted posting own selfies, selfies with a partner, and group selfies. Moreover, men's Vanity, Leadership, and Admiration Demand scores each independently predicted the posting of one or more types of selfies. Our findings provide the first evidence that the link between narcissism and selfie-posting behavior is comparatively weak among women than men, and provide novel insight into the social motivations and functions of online social networking.

Poster Presentation   **Session C**

Systematic variation in the specification of discourse relations: A pilot study

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Studies of causal inference in comprehension (Van den Broek & Trabasso, 1986; Trabasso & Sperry, 1985) allow the conclusion that, in terms of Levelt's (1989) model of language processing, discourse information is processed and integrated with extra-linguistic information (like the discourse model, or situation information) at the level of the conceptualizer level. The degree to which extra-linguistic knowledge is integrated, however, remains uncertain; Ferreira, Bailey & Ferraro's (2002) observation of a "good enough"-principle in language comprehension suggests that information may not be aligned automatically even if it has been available from the discourse. In our study, information about discourse processing is accessed through production in the guise of an editing task. Participants receive a string of content statements (based on Bellos, 2013) and are requested to join them into a narrative discourse of the commentary genre; actually, this means that they need to scan the text for discursive coherence, generating and adding in missing or incomplete discourse relations (DRs). Frequently, resulting DRs permit clear identification of their discursive function in the categories outlined by Asher & Lascarides (2003), and in some instances they even suggest a degree of overspecification; however, this is not always the case. The variation observed appears to be systematic; in other words, only certain DRs are regularly encountered with full specification, while others permit some overlap between discursive functions that are clearly distinct with respect to the meaning they coney. The issue of genrespecificity notwithstanding, this finding indicates that discourse processing may be shaped by a degree of "good enough"-type cognitive economy.

Poster Presentation

Concept learning in mixed-language contexts

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In bilingual communities language mixing is avoided in formal schooling. Two languages are used for teaching but each academic subject is taught in only one language. This principle known as the 'one subject-one language' rule, is grounded on the fear that language mixing may harm or delay learning, as compared to single-language learning contexts. The aim of this study was to test the scientific validity of this assumption by investigating the consequences of acquiring new concepts using a method in which two languages are mixed as compared to a purely monolingual method. In a series of experiments, native bilingual children immersed in a bilingual educational system, native bilingual adults and young non-balanced bilingual adults learnt new concepts and their features by associating their pictures to two different definitions. Half of the participants completed the learning process receiving one of the definitions in one language and the other definition in the other language they knew. The other half of the participants completed the learning phase in a single-language context. Different measures of learning and concept consolidation were obtained in different tests. We found no evidence in favor of the non-mixing method either in the group of balanced bilingual children or in the two groups of bilingual adults, demonstrating that the 'one subject – one language' rule is not a scientifically grounded educational premise. These results demonstrate that learning in a mixed-language context does not lead to impoverished concept acquisition and consolidation in balanced and in non-balanced bilingual samples of different ages. In light of these results, we conclude that in the full absence of negative consequences of mixed-language contexts for learning and considering the ecological validity of this method in bilingual societies, its use in formal schooling should be promoted.

Poster Presentation

Neural processing of congruent and incongruent audiovisual speech in school-aged children

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Speaker´s articulatory gestures affect speech perception. Visual gestures can even change the perception of auditory speech signal, which is known as the McGurk-effect, the illusion where dubbing an auditory phoneme onto a video of incongruent articulatory movements causes changes in auditory perception. In adults, the incongruent audiovisual syllable (McGurk-stimulus) activates the auditory change-detection system even without changes in auditory stimulus, and this can be seen in the mismatch negativity (MMN) brain response. In children, McGurk-effect is often weaker, and little previous knowledge exists about the neural level correlates of McGurk-effect in children. Using event related potentials (ERP) we investigated brain response for congruent and incongruent audiovisual syllables in 18 children (aged 6;11-11;1 years). We used an oddball paradigm with congruent audiovisual /mi/ as the standard stimulus and congruent audiovisual /ni/ and incongruent A/mi/V/ni/ (McGurk-stimulus) as the deviant stimuli. The response to the congruent /ni/ deviant was significantly more positive at frontal and central areas in the analysis time window of 150-350 ms after the auditory stimulus than response to standard /mi/, and more negative in the time window of 177-250 ms at the frontal Fz-site and at 205-260 ms at the occipital Oz-site. The response to the McGurk deviant was significantly more negative at occipital Oz-site than response to standard /mi/ at the time window of 216-305 ms after auditory stimulus. No significant differences were observed at the fronto-central areas between the standard and incongruent deviant responses. The results indicate that in children, congruent audiovisual and McGurk syllables are processed differently at the neural level. The change detection response of the congruent deviant stimulus can be observed both at fronto-central and occipital areas whereas the incongruent deviant stimulus causes processing differences at the occipital areas. This may reflect weaker auditory discrimination for McGurk-stimuli in children.

Poster Presentation

Influence of logographic and alphabetic writing systems on auditory information processing: The generalizability and stability issues

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Learning to read modifies how one processes phonological information. One impressive change is the development of phonemic awareness which is strongly associated with reading ability, especially in alphabetic systems. Here, we investigated whether the ability to analyze phonological information at a fine-grained level is also generalized to non-linguistic auditory material and whether the influence of the dominant writing system is stable or can be modified by an exposure to a different writing system during the experiment. The generalizability issue was addressed by comparing the performance of French (alphabetic) and Taiwanese (logographic) adult readers in same/different phoneme and pure-tone judgment tasks. Since learning to read in an alphabetic system requires the development of "letter-sound" mappings, French participants were expected to show better performance than Taiwanese participants in phoneme judgment. Importantly, if the ability to process information at a fine-grained level is also generalized to non-language material, they should also show better performance in pure-tone judgment. To address the stability issue, two additional groups of Taiwanese participants were also exposed to either traditional Chinese writing system or Zhuyin symbols during the judgment tasks. If an exposure to Zhuyin, which is a phonetic notation system, could enhance the ability to process information at a fine-grained level, Taiwanese participants who were exposed to these phonetic symbols should behave more like French participants than those who were exposed to Chinese characters. We found that while French participants had better performance in phoneme judgment, no difference between the two populations was observed in pure-tone judgment. Thus, the ability to process information at a finegrained level does not seem to generalize to non-linguistic material. However, being exposed to Zhuyin symbols improved performance in phoneme judgment, suggesting that the long-term influence of the dominant writing system could be modified by an exposure to another writing system.

Poster Presentation

Is the relationship between Rapid Automatized Naming and reading mediated by task format

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The acquisition of expert reading skills is a crucial achievement in our modern societies. The identification of the variables likely to explain individual differences in reading abilities is therefore of particular interest in recent years. Reading skills are strongly related to phonological awareness (PA) and rapid automatized naming (RAN) abilities. PA refers to the ability to identify and manipulate the phonological units of words. RAN consists in naming as fast and accurately as possible visual stimuli displayed, such as letters and pictures. These two variables share common underlying processes but each remains a unique predictor for later reading skills (Kirby et al., 2010). Recently the relationship between different formats of RAN and reading has been investigated: serial RAN (matrix of 5 stimuli repeated 4 times in a randomized order) or discrete RAN (with each stimulus displayed one by one). Some studies have reported different links between the two RAN format and text or word list reading (deJong, 2011). To further investigate the impact of the format on the RANreading relationship it is necessary to systematically compare RAN and reading tasks in discrete and serial formats which is the purpose of the current study. We used a discrete and a serial picture and letter RAN composed by the same stimuli and reading tasks also involving a discrete and a serial presentation procedures. Thirty-three French speaking children, 9 to 10 years-old took part to the experiment. Results show that serial RAN abilities correlate with reading skills, whichever the reading task format. Interestingly, in French it was the articulation time which correlates with reading performance whereas inter-stimuli time does not. On the other hand, discrete RAN abilities only correlate with discrete reading tasks. These findings suggest that different processes are involved in RAN-reading relationship depending on the format of each task.

Poster Presentation

Session C

The influence of the first language on syntactic processing in a second language: An ERP study with German learners of Dutch

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There is a growing interest in second language (L2) syntactic processing, and in particular in the question whether L2 speakers show native-like ERP signatures when processing sentences with syntactic violations. However, little is known on how L2 speakers overcome direct conflicts between L1 and L2 syntactic rules. Sentence-final double infinitives in German and Dutch pose such a conflict as they differ in the order of the infinitives: the two infinitives in the Dutch sentence 'Ik heb het huiswerk niet willen maken' (I did not want to do the homework) would be reversed in its German translation (…machen wollen). ERPs were used to explore in how far first-year German learners of Dutch have already managed to overcome L1 rules and show native-like processing signatures to the word order that is incorrect in Dutch, but correct in German (…*maken willen). German and Dutch (control) participants read and made grammaticality judgments on Dutch sentences containing the afore-mentioned structure. While the behavioral results show comparable error rates for L1 and L2 speakers, ERP patterns (measured on the first infinitive) differed. Dutch speakers showed a clear P600 effect for word order violations (onset 500ms). In L2 speakers, in contrast, this P600 effect was delayed (onset 700ms), and was furthermore preceded by an N400-like effect over left posterior electrode sites (200-600ms). ERPs for L1 and L2 speakers did not differ for a control condition containing a structure that is compatible in the two languages (inverted word order in subordinate clauses, P600 in both groups). In line with other studies reporting biphasic N400-P600 patterns (Tanner et al, 2013), we conclude that the conflict with the L1 in the critical sentences leads to non-native-like processing of this type of violation. Thus, despite native-like behavioral performance in the learner group, the L1 interferes with online L2 processing.

Poster Presentation

A new approach for analyzing ERP data on speech processing: Multivariate Temporal Response Functions (MTRF) and Functional Principal Component Analysis (FPCA)

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Electroencephalography (EEG) is widely used to study language processing, because the signals capture the continuous nature of language processing as it unfolds over time, with millisecond resolution. Event-related potentials (ERPs) are portions of the EEG signal which are time-locked to some event of interest. ERPs are obtained by aligning and averaging time-locked epochs from the continuous EEG signal. Generally, ANOVAs are used to determine points in time (as defined by time bins of hundreds of ms) at which factors under study reliably affect the ERP waveform. Although the use of ANOVA is still common practice in ERP research, averaging over participants and items has several disadvantages. ANOVAs only deal with the factorial manipulation of one independent variable and disregards the effects of additional continuous variables and do not account for random variability due to item and participant. In this paper, we introduce a combination of Multivariate Temporal Response Functions (MTRF) and Functional Principal Component Analysis (FPCA) for analyzing ERP data in speech processing. MTRF allows separating exogenous and endogenous brain activity. FPCA represent the endogenous components of the EEG recordings of individual tokens as a weighted sum of time functions that correspond to the conventional ERP components. The weights can be analyzed with linear mixed effects regression modelling. Therefore, FPCA can overcome the most important limitations of conventional ANOVAs. MTRF allows analyzing endogenous components in the presence of substantial and variable exogenous brain activity if the epoch of interest in in the middle of a sentence. We show the power of MTRF in an analysis of the difference between words and non-words and between full and reduced variants of words in mid-sentence position. The advantage of FPCA over ANOVA is demonstrated by analyzing the differences between processing full and reduced variants of polysyllabic words in isolation and in mid-sentence position.

Poster Presentation

The impact of cognate status on morpho-orthographic processing: A masked priming study with intermediate and high profiency Portuguese- English bilinguals

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The question of whether there is a morphological decomposition in second language (L2) is still a controversal issue (Dunabeitia, Dimitripoulou, Morris, & Diependale, 2013). The majority of works on this matter have considered proficient bilinguals by using mainly noncognate words (translation equivalents that do not share form; casa-house in Portuguese and English, respectively). However, as L2 word recognition is modulated by L2 proficiency and cognate word status (van Hell & Tanner, 2012), it is crucial to explore the role of these variables on morpho-orthographic processing. For this purpose, intermediate and high proficient Portuguese- English bilinguals carried out a masked primed lexical decision task. One-hundred and twelve English words (56 target words + 56 pseudowords) were selected. Target words were distributed to four experimental conditions as a function of the cognate status of their root and affix morphemes: root noncognate and affix cognate (RNCSC, encadeamento-enchainment), root cognate and affix noncognate (RCSNC, simplicidade-simplicity), root and affix cognates (RCSC, doutoral- doctoral), and root and affix noncognates (RNCSNC, armazenamento-storage). The degree of cross-language orthographic overlap of roots and affixes was calculated by using the Normalized Levenstain Distance (NLD). Target words could be preceded by morphologically related (package – PACK) or unrelated words (booster –PACK). Related and unrelated words were matched in log frequency per million and length. Likewise, prime and target words were matched in log frequency per million, bigram frequency, length in number of letters, and orthographic and phonological neighborhood. These values were taken from the N-watch database (Davis, 2005). The degree of orthographic overlap of root and affix morphemes of prime words were also matched between conditions. Results were interpreted in the context of most relevant theories of early morpho-orthographic segmentation (see Beyersmann, Castles, & Coltheart, 2011, for overviews).

Poster Presentation

Relations among specific linguistic, general cognitive skills and difficulties in word identification with very poor readers : a comparative study

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Within the reading learning field, three kinds of readers are commonly distinguished: good readers that referred to individuals with a lexical age in the norm or above, poor readers with a one year lexical age delay and dyslexic children characterized by a delay exceeding two years. However, some surveys regularly point out the existence of another population that may fall in between poor and dyslexic readers (that is with a delay between one and two years) but seldom studied: very poor readers. It is assumed that their learning delay could not be accounted by a structural failure but rather results from an interaction of socio-economic, biological and cognitive factors (Snowling & Hayiou-Thomas, 2006; Billard et al., 2010). Cognitive abilities that were examined previously mainly focused on phonological skills. Nevertheless, other cognitive factors could explain the learning difficulty of very poor readers. The goal of the presented study was then to investigate further cognitive abilities which differentiate very poor from good readers and to explain their difficulties in word identification. 8-9 years-old very poor (N=28) and good readers (N=28) were tested on word identification and on both specific linguistic (vocabulary, morphology, phonological awareness and memory, naming and orthographic) and general cognitive competences (memory and visuo-attentional spans, reasoning, inhibition) via standardized tests. The group performances were compared on each competence and regression analysis were performed between competences and reading performances. Preliminary analyses show that what differentiates very poor from good readers is efficiency of the two reading routes. Moreover, results indicate that, for very poor readers, the variability in reading is explained especially by general cognitive abilities. These results will be discussed assuming a continuum between functional and structural difficulties, in particular within the Valdois' dyslexia framework (Ans & Valdois, 1998, Lobier et al., 2012) and the role of visuoattentional span.

Poster Presentation

Translatability and the activation of literal and figurative meaning in idioms by native and nonnative listeners

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The comprehension of idioms in a second language (L2) poses a myriad of challenges for nonnative listeners. The dominantly non-compositional nature of idioms raises important questions about comprehension and the activation of figurative and literal meaning: How soon is figurative meaning available in comparison with the literal meaning of constituent words? And does the native language (L1) play a role in this process? While L1 research suggests early access to figurative meaning (Swinney and Cutler, 1979; Tabossi et al., 2009), some L2 research suggests that L2 listeners might not have the same access (Cieślicka, 2006; Siyanova-Chanturia et al., 2011). However, off-line studies do suggest that directly translatable idioms (from the L1) are easier for L2 speakers to produce and comprehend (Abel, 2003; Cooper, 1999; Liontas, 2002). Our cross-modal priming study tries to reconcile this information by looking at the activation of literal and figurative meaning in 64 English idioms categorized as translatable and non-translatable from English to German. Translatable idioms have word-for-word equivalents in both languages, while non-translatable idioms have an idiomatic equivalent in both languages irretrievable by simple translation. 64 native German speakers (with proficient English) and 40 native (American) English speakers participated. Sentences containing idioms were presented auditorily via headphones followed by visual target words related either to the figurative or literal meaning of the idiom presented visually 400ms later. The reaction times for literal targets and figurative targets were compared to unrelated control targets (e.g. "to pull someone's leg", literal targets: "walk" compared to "milk", figurative targets: "joke" compared to "ship"), and the targets were controlled for frequency and syllable count. While priming effects for non-translatable idioms were not found, priming was shown for both literal and figurative meaning in non-translatable idioms for both listener groups. Possible implications of and reasons for these results will be discussed.

Poster Presentation

Factors of modulation in second language learners' indirect or direct access to second language word meanings

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In this study, we tested the predictions of the Revised Hierarchical Model (RHM, Kroll & Stewart, 1994; see discussions by Brysbaert & Duyck, 2010 and Kroll et al., 2010) by examining how adult L2 learners with varying L2 proficiencies performed a translation recognition task with semantically related and unrelated incorrect translations. The RHM predicts that with growing proficiency L2 learners gradually move from accessing L2 word meanings indirectly via the L1 translation equivalent to direct conceptual mediation via the conceptual link, in turn becoming more sensitive to semantics. Thirty-five German L2 learners of English (mean age = 23) with varying L2 proficiencies (score = 79, SD = 11) and varying daily English usage (mean = 35%, SD = 11, scale from 0 = all German to 100 = all English) took part. The results indicated significantly slower RTs and lower accuracies for semantically related than for unrelated stimuli. This effect was best explained by daily usage of English and less so by L2 proficiency. This finding expands the RHM's predictions and indicates that, beyond L2 proficiency, daily L2 usage modulates how extensively L2 learners exploit conceptual information during translation recognition, providing evidence that learners increasingly map L2 word forms to concepts depending on their active and regular usage of the L2. Brysbaert, M., & Duyck, W. (2010). Is it time to leave behind the Revised Hierarchical Model of bilingual language processing after fifteen years of service? Bilingualism: Language and Cognition, 13, 359–371. Kroll, J.F., & Stewart, E. (1994). Category interference in translation and picture naming: Evidence for asymmetric connections between bilingual memory representations. Journal of Memory and Language, 33, 149–174. Kroll, J.F., Van Hell, J.G., Tokowicz, N., & Green, D.W. (2010). The Revised Hierarchical Model: A critical review and assessment. Bilingualism: Language and Cognition, 13, 373–381.

Poster Presentation

Neural overlap of L1 & L2 semantic representations in bilinguals

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In a first fMRI study, we investigated the neural overlap between L1 and L2 semantic representations of translation equivalents in a production task (picture naming). Through MVPA, a pattern classifier was trained on the activation pattern associated with the naming of each of the 10 concepts in one language for 5 of the 6 blocks (training data). Subsequently, this pattern classifier was used to classify the activation pattern associated with the naming of the 10 concepts in the corresponding sixth block of the other language (test data). The results showed that the classifier was able to accurately predict which concept was named. These results provide evidence for the idea that conceptual representations of L1 and L2 overlap in the brain. To assure that the classifier performance only reflects the semantic overlap between the two languages, lexical similarity between the translation equivalents and visual similarities between the two images of a concept were maximally reduced. Theoretical implications will be highlighted.

Poster Presentation

Session C

Implicit second language learning of grammatical gender in natural communicative situations

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Many people spend a period of their life immersed in a second language (L2) environment. Although most of them improve at their L2, they rarely ever reach native-like proficiency. This persistence of L2 errors has been referred to as second language 'fossilization'. Interestingly, fossilization occurs despite being exposed to correct L2 input. Therefore, the question arises if and under which conditions natural corrective input leads to L2 improvement. The present study examined L2 learner's sensitivity to implicit corrective feedback in a dialog-like situation. Errors under study were grammatical gender errors in German learners of Dutch, which result from incorrect L1 transfer. These errors are known to be highly susceptible to fossilization (Lemhofer et al., 2010). We used a simulated dialog-game to examine the effect of implicit corrective feedback in a fairly natural, but experimentally controlled situation. Participants were asked to complete a version of the card description task that has been used to demonstrate syntactic priming (Branigan et al., 2000). In its original version, two persons take turns describing cards to each other. While one is describing a card, the other has to identify and select the described card among various alternatives. For the current purpose, participants were not interacting with real conversation partners, but received input via audio recordings. Critically, we examined whether an initial gender error by the participant (e.g., *de pistool, 'the pistol') would be corrected after hearing the correct phrase (het pistool) uttered by the virtual 'partner'. Further factors under investigation were initial error stability (i.e. whether errors were consistent across several trials) and the time lag between corrective feedback and the participant's anew production of the phrase. Results will not only provide insights into mechanisms of fossilization and implicit L2 learning, but also reveal the suitability of a new paradigm to study implicit L2 learning.

Poster Presentation

Do non-native speakers align with native speakers?

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Many studies have shown speech adaptation effects in the native language. Such adaptation effects may be particularly useful in second language (L2) production because they might facilitate learning. However, until now there are few studies that have investigated whether speech adaptation also occurs in non-native speakers. In this study, we have tested whether non-native speakers align their pronunciation of particular phonemes to the pronunciation of an interlocutor. Moreover, it was observed whether the presence of the interlocutor affected pronunciation as well. Specifically, we tested whether Dutch-English bilinguals adapt the way they pronounce the English phonemes /ɒ/, /a/, and coda /b/ when reading aloud sentences after being exposed to speech of an English native speaker. The phonemes /ɒ/, /a/, and coda /b/ do not exist in Dutch and are often replaced with Dutch /ɔ/, /ɛ/ and /p/, respectively, by Dutch-English bilinguals (Collins & Mees, 1996). In one condition, participants heard the confederate reading aloud sentences over headphones. In another condition, the English confederate participated in the experiment, meaning that participants could not only hear the English speaker, but could also see him pronouncing the English sentences in a social context. It is hypothesized that speech adaptation will be more likely to occur if the confederate is present. Results will be discussed and theoretical implications will be highlighted at the conference.

Poster Presentation   **Session C**

Does metalinguistic skills play a role on statistical speech segmentation?

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Consonants and vowels play distinct roles during language processing. While consonants are preferentially involved in lexical processing, vowels tend to mark syntactic constituency through prosodic cues. Consistently, research on statistical learning of artificial languages (AL) has demonstrated that consonants support statistical computations, whereas vowels allow some structural generalizations (e.g., Bonatti, Pena, Nespor, & Mehler, 2005). Nevertheless, these asymmetries could be by-products of the acquisition of explicit knowledge, such as the development of metalinguistic skills in literacy acquisition. To examine the latter idea, preschool children (4 to 5 year-olds) participated to two experimental sessions in which they were exposed to two ALs presented auditorily in the form of continuous speech streams. In one AL the statistical information consisted in the transitional probabilities (TPs) between consonants; in the other, it consisted in the TPs between vowels. Learning of the ALs was assessed by means of a recognition task opposing words to partwords. Phonological awareness skills were assessed for pre-schoolers by means of three different tests (phoneme and syllable deletion, and phonemic sensibility). Children were able to exploit the statistical information carried by consonants in order to learn the AL, but failed to learn the AL when the relevant information was carried by vowels. More importantly, metalinguistic skills did not predict the performance in any of the ALs, suggesting that this difference is independent of the acquisition of phonemic awareness. These results extend previous findings with adult learners to pre-schooled children, supporting the idea of a distinct role of consonants and vowels in language learning, independent of literacy acquisition and present early in life.

Poster Presentation

Learning Orthographic Structure with Sequential Generative Neural Networks

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The ability to extract statistical regularities from the environment is a powerful and general learning mechanism of the brain, which operates across domains, modalities, and development. In the present study we tackle the issue of learning sequences of elements within the framework of probabilistic generative models, which can be implemented as stochastic recurrent neural networks that learn to reconstruct the sensory input through feedback connections. We investigated whether the statistical structure that is implicitly contained in letter sequences can be learned by a recently proposed sequential extension of Restricted Boltzmann Machines, the Recurrent Temporal Restricted Boltzmann Machine (RTRBM). RTRBMs use a common layer for encoding both the input and the model's prediction, and learn to process sequential information in an unsupervised way by trying to accurately reproduce the training sequences. RTRBMs can therefore produce top-down activations on the sensory units from internal representations through their intrinsically stochastic dynamics. We also present a modified version of deterministic, Simple Recurrent Networks (SRNs), which uses a logistic sampling process over the output units to generate the next element of the sequence to be fed back to the network. Our findings show that both RTRBMs and the extended SRNs can successfully learn the orthographic structure of English words, by building a probabilistic model of letter sequences that can be used to predict the next letter given a certain context, as well as to autonomously generate high-quality (i.e., graphotactically correct) pseudowords. We compared the prediction performance of these models with that of other non-connectionist generative models (n-grams and hidden Markov models). We then evaluated the generative ability of the considered models in terms of quality of the letter strings produced in comparison to existing pseudoword generators. Our results suggest that sequential generative neural networks are promising candidates for modeling cognition in the temporal domain.

Poster Presentation

Revisiting the cognate facilitation effect in the lexical decision task using pupillometry

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Pupillary responses have been used to infer cognitive effort in different domains, such as perception, memory, and decision making (see Sirois & Brisson, 2014, for an overview). However, it has scarcely been used in psycholinguistic research. To date, most psycholinguistic studies that have recorded pupil measures have examined the effect of lexical variables, in particular word frequency (e.g., Kuchinke et al., 2007) and orthographic neighborhood (Schmidtke, 2014), obtaining a convergence between behavioral and physiological data (i.e., slower reaction times are associated with larger pupil sizes). In the bilingual domain, this scarcity of research is even more pronounced. For example, no previous studies have explored the cognate facilitation effect in lexical decision task using pupillometry. This effect reveals that bilingual speakers respond faster to cognate words (i.e., words with similar meaning and form in two languages) than to non-cognate ones (i.e., words with similar meaning but different form in the two languages), and it has often been used as a tool to investigate whether lexical access in bilinguals is language-specific or not. The aim of the present study was to provide further evidence for the cognate effect by recording pupillary responses during a lexical decision task. A group of proficient balanced Spanish-Catalan bilinguals responded to words belonging to one of three experimental conditions: identical Spanish-Catalan cognates (e.g., reinareina [queen]), non-identical cognates (e.g., escuela-escola [school]), and non-cognate translation equivalents (e.g., otono-tardor [autumn]). Words were rigorously equated in many lexical and sub-lexical variables. Our results revealed a clear cognate facilitation effect for both behavioral and pupillary data. Namely, slower reaction times and larger pupil sizes were observed for non-cognate words. These results offer convergent evidence towards the non-language-specificity of lexical access in bilinguals.

Poster Presentation

Grammatical gender affects odour perception and memory

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Language is thought to be weakly linked with odour cognition, as demonstrated by our poor ability to name smells. Because of this, odour perception can easily be influenced by verbal labels and descriptions. For example, odours are rated as more pleasant when labelled with positive compared to negative terms, such as "cheese'" compared to "body odour" . The current study aimed to further test the boundaries of the influence of language on odour cognition by focusing on a more subtle factor: grammatical gender. We manipulated the grammatical gender of French fragrance descriptions to test whether the congruence with fragrance gender would affect the way fragrances were perceived and remembered. Native French speakers read descriptions of fragrances containing three ingredients that were either all of feminine gender (e.g. citrouille, sauge, marjolaine) or all of masculine gender (e.g. girofle, pin, savon). They then smelled commercial masculine or feminine fragrances from opaque squeezy bottles and rated them on a number of dimensions (e.g. pleasantness). At the end of the experiment, participants were presented with the original fragrances plus an equal number of new fragrances and were instructed to respond "new" if they had not previously smelled the fragrance, or "old" if they had. Results showed fragrances tended to be rated more positively when the gender of the fragrance description and the gender of the fragrance differed. However, fragrances were remembered better when they had been presented with a description whose grammatical gender matched the gender of the fragrance. Overall, results suggest even grammatical manipulations of odour descriptions can affect the way an odour is perceived or remembered. However, the way in which this effect plays out may differ across aspects of odour cognition (i.e. perceiving versus remembering).

Poster Presentation

Disentangling the influence of orthography from phonology in lexical processing: evidence from an Indian language

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The role of orthography in lexical processing continues to trigger scientific debates. In this context, this study aimed to investigate the role orthography in lexical processing through a cross-orthographic masked priming paradigm. For the current purpose, we used loan words (from English) in Malayalam (a language spoken in Kerala, southern state of India) as primes while a group of 50 Malayalam-English bilingual young adults performed the lexical decision task. We systematically varied the primes in three experimental conditions. In the same phonology–same orthography (SPSO) condition, the prime and targets were the same words in the same orthography (i.e., repetition priming) (e.g., BUS – BUS). In the same phonology–different orthography (SPDO) condition, the primes' orthography was in Malayalam and targets were in English (ബസ് [bus] - BUS). Finally, in the control condition (CC), the primes were a series of non-orthographic characters and targets were in English (e.g., $#&*!# – bus). Each prime was forward and backward masked by a series of #### symbols and was presented for 50ms. The response times of accurate responses were analyzed using repeated measures of ANOVA with lexicality and type of prime as factors. The results showed significant main effects of both lexicality and prime types. The RT of the SPSO condition was significantly shorter than that of SPDO and control condition. The SPDO condition, however, did not significantly differ from the control condition. Our findings are thus indicative of the influence of primes' orthography in lexical processing.

Poster Presentation

Detection of change and visual Working Memory in trait, social and state anxiety

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Previous research suggests that anxiety is associated with some kind of altered cognitive functioning, with some studies showing reductions in working memory related tasks. On the other hand, trait social anxiety has been found to be associated with higher visual Working Memory (vWM; e.g. Moriya & Sugiura, 2012), at least with the detection of change. In the present study we examine the relation between dispositional (trait and social) anxiety or state anxiety and the ability to detect change, with the latter being used as an estimate of visual working memory (vWM), as well. We used a change detection task with two conditions -one with two items and one with four items- and two experimental parts, with the second part involving negative feedback in order to induce state anxiety. With the four-items condition being used as an estimate of vWM, the results suggest that socially anxious individuals have higher vWM than individuals with low social anxiety. Trait anxious individuals, however, have been found to have comparable vWM with individuals with low trait anxiety. State anxiety did not have an effect on (change detection) performance, whereas fear of negative evaluation in highly anxious individuals is assumed to be responsible for the improved performance we found (compared to individuals with low trait or social anxiety) in the negative feedback condition, but only in the two-items condition (i.e. the easy one). Thus, we show that dispositional anxiety is associated with cognitive ability –at least with change detection sensitivity-, and, along with situational factors, such as situations involving negative evaluation, may have an important effect on performance.

Poster Presentation

Empirically Constrained Network Models for Contrast-dependent Modulation of Gamma Rhythm in V1

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Laminar recordings of spiking and of the LFP in macaque area V1 and MEG signal in human V1 show a robust increase in frequency of the spectral response with increasing stimulus contrast. This effect is remarkably similar across the different spatial scales of measurement in our data (single units, LFP, MEG) (Hadjipapas et al, 2015). Interestingly, the V1 spectral responses show a power saturation or decay with increasing contrast (a proxy for input strength), which may provide insights into the generative mechanisms of gamma oscillations. Gamma is often simulated via a Pyramidal Interneuron Network Gamma (PING) model. Even in this simple model, many crucial parameter values are unknown and set by convention. Here, we aimed to develop an approach to constrain PING model parameters so its oscillation behavior closely mimics the empirical oscillatory data we have obtained. We first derived empirical parameters that describe the spectral changes as a function of contrast. Then we systematically manipulated a number of network parameters and determined regions in parameter space that maximized the match between model output and empirical data. The results show that in order to obtain realistic model behavior, the effects of changes in E-drive (input strength) should affect mostly the excitatory neurons in the model, whereas the effects on inhibitory network neurons should be limited. Further, a specific balance between the strength of E=>I and I=>E connectivity is required for realistic network behavior. Moreover, the LFP power decay likely results from a decoupling among inhibitory neurons at high input strengths. Hence, our approach enhances the empirical validity of gamma models. This is relevant when these models are expanded into larger and more differentiated networks. Current work focuses on constructing an empirically-constrained V1 columnar model that can account for the observed similarities and differences between LFP and MEG responses.

Poster Presentation

Strategy Selection in Collaborative Spatial Tasks

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The research investigates the emergence of description strategies in collaborative spatial tasks based on the methodological framework of Cognitive Discourse Analysis (CODA) (Tenbrink, 2015). A corpus of dialogues taken from previous research by Galati and Avraamides (2013) in which pairs of Directors and Matchers jointly reconstructed a spatial layout were analysed. Overall, we examined: (a) how overarching description strategies emerge as a function of the contextual cues available, (b) how strategy choices evolve over time, (c) how strategy choices relate to cognitively important junctures in the task, indicated by the Matcher's feedback, and (d) how successful specific strategies are in terms of efficiency of coordination and accuracy on the task. The transcripts were segmented and linearised into discourse units and then each unit was coded for the presence of a strategy conceptualizing the layout as a global system (one that includes most of its objects and considers its structure) or local system (one that refers to subsets of objects) and for the use of quantitative terms (e.g., centimeters, degrees). Matcher's units were also coded for their type of contribution (e.g., acceptance, question, recap, etc.). The results demonstrate that the use of global and local description strategies was largely complementary, and depended on the convergence of cues and their a priori availability. Furthermore, the convergence of cues also improved communicative efficiency. Moreover, the increasing use of global strategies was related with more accurate reconstructions. Finally, as pairs increasingly ratified what was mutually understood reconstructions were more accurate as well.

Symposium

The role of long-term memory in working memory

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The role of long-term memory in working memory1 1- This symposium is proposed by EWOMS, a satellite group of ESCOP Long-term memory and working memory are usually opposed in terms of capacity limit and duration of retention.While long-term memory is conceived as unlimited both in capacity and duration, maintenance in working memory is strongly constrained to few items during a short delay. Since the beginning of the study of working memory, the question of its links with long-term memory was fundamental. Nowadays, the conceptions on the relationships between long-term and working memory vary greatly. Some authors propose that working memory is the activated part of long-term memory (Cowan, 1999; Engle, et al., 1999), while others favor the idea that there are two distinct memory systems (Baddeley, 1986; Barrouillet & Camos, 2015). The aim of the proposed symposium is to present up-to-date research on this question, and to represent the various conceptions and approaches by leaders in the field of working memory. The symposium included five oral presentations. Long-term representations do not moderate the effect of attentional refreshing on working memory. Valerie Camos1, Gerome Mora2, & Vanessa Loaiza1,3 1- Universite de Fribourg, 2- Universite de Bourgogne, 3- Universitat Zurich Roles of long-term knowledge and spatial rehearsal in the visuo-spatial bootstrapping paradigm Candice Morey, University of Edinburgh Three questions to ask about the WM-LTM relation, and three methods to answer them. Klaus Oberauer1, Vanessa Loaiza1, Alessandra Souza1, Edward Awh2 & Stephan Lewandowsky3 1- Universitat Zurich; 2- University of Oregon; 3- University of Bristol Morphological knowledge and rehearsal in complex span Elisabeth Service, McMaster University The role of procedural long-term memory in encoding and updating working memory contents Andre Vandierendonck, Universite de Ghent

Symposium

Symposium Abstracts

Long-term representations do not moderate the effect of attentional refreshing on working memory

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The relations between long-term memory (LTM) and working memory (WM) have always been a field of intense debate in cognitive psychology. Nowadays, models of WM remain opposed on this question, and some models conceived WM as the activated part of LTM while others suggested that the two memory systems are distinct. Despite the importance of the question, studies are scarce, and little is known about the impact of effects known for affecting LTM on the maintenance of information in WM. The aim of the present study was to examine how LTM effects would affect the maintenance of verbal information in WM, and specifically how they would modulate attentional refreshing, which is a major mechanism of WM maintenance. In three experiments, participants had to maintain memoranda varying either in frequency (high- vs. low-frequency words), lexicality (words vs. non-words) or level of processing at encoding (shallow vs. deep) while performing concurrent tasks in complex span tasks. The availability of refreshing was manipulated by varying the attentional demand of the concurrent tasks. Although frequency, lexicality, and level-of-processing affected recall from working memory, they never interacted with the experimental manipulations of refreshing. These findings shed light on the relations between WM and LTM and on the refreshing process in WM.

Symposium Abstracts

Roles of long-term knowledge and spatial rehearsal in the visuo-spatial bootstrapping paradigm

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Presenting verbal information in a familiar visuo-spatial layout enhances serial recall, an effect known as the visuo-spatial bootstrapping effect. Evidence suggests that the effect depends at least partly on prior knowledge of the spatial layout, but it is not clear how: perhaps long-term knowledge acts to promote more efficient rehearsal. We sought for evidence of differential spatial rehearsal by examining gaze patterns during retention of visually-presented verbal lists under conditions varying in the familiarity of the spatial layout. Young adults and two groups of children (>9 years old or <7 years old) performed verbal serial digit recall tasks. Visuallypresented digits were show either 1) in the center of the screen, 2) in a layout identical to a typical telephone keypad, 3) in a layout organized like a telephone keypad, but with randomly arranged digits. After a 5-second retention period, participants orally recalled the digit lists. We present accuracy data, along with analyses of fixations in order to understand whether looking during retention relates to recall, and whether these relationships differ depending on the presentation format and age. The youngest children did not usually have explicit memory for the typical keypad layout, and were unlikely to show a strong bootstrapping effect on recall, consistently with the idea that the effect depends on long-term memory. We further analyze gazes to test whether individuals' fixation sequences during retention were at all likely to correspond to presentation and/or recall order. Such patterns could be considered attempts to covertly retrieve the items, and could support or contradict conjectures about the development of rehearsal processes in children.

Symposium Abstracts

Three questions to ask about the relation between working memory and long-term memory, and three methods to answer them

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[3]University of Bristol, School of Psychology, United Kingdom

We will discuss three questions about the relationship between working memory and long-term memory: (1) To what extent is information held in working memory remembered over the long term? (2) To what extent can people draw on long-term episodic memory to assist their performance in a working-memory task? (3) To what extent does episodic long-term memory intrude in working-memory performance, creating proactive interference? We will illustrate how these questions can be address through experimental paradigms: The Hebb paradigm speaks to (1) and (2); the McCabe paradigm speaks to (1); variants of a proactive-interference paradigm speak to (2) and (3).

Symposium Abstracts

Morphological knowledge and rehearsal in complex span

E. Service[1, 2], S. Maury[1]

[1]McMaster University, Linguistics and Languages, Canada
[2]University of Helsinki, Division of Cognitive and Neuropsychology, Finland

Psycholinguistic models of the representation of morphologically complex words in the mental lexicon of Finnish speakers propose that inflected words such as CHILD'S have representations for both the stem (CHILD) and the suffix ('S). During both comprehension and production, these two parts of the word are hypothesized to be processed separately. Derived words such as childhood are thought to be mostly processed as wholes in comprehension but to be constructed from their parts in production. Neurophysiological experiments suggest that an extra processing cost for morphologically complex words is caused by the syntactic-semantic information in the suffixes. Several experiments investigating the behaviour of morphologically complex Finnish words in working memory found an interaction between memory task and morphological load, such that simple monomorphemic nouns were always easier to recall than inflected nouns in both simple and complex span tasks. However, derived words tended to be recalled more like monomorphemic words in simple span tasks whereas they behaved more like inflected words in complex reading span tasks. These complex span experiments had included sufficient time between sentences in the reading span task for articulatory rehearsal to take place. We wondered whether the same pattern of results would be seen if this extra time were removed, making rehearsal unlikely. In two experiments, the same monomorphemic > derived > inflected pattern of recall was now found in both simple and complex span. As neither the simple nor complex span tasks now favoured cumulative rehearsal based on articulation, the binding of the items together for recall was likely to depend more on attentional refreshing. This system appears to rely on unitary representations of derived words, suggesting it accesses the input rather than the output lexicon in LTM.

Symposium Abstracts   10:20 – 10:40

The role of procedural long-term memory in encoding and updating working memory contents

A. Vandierendonck[1]

[1]Ghent University, Experimental Psychology, Belgium

Most theories of working memory underestimate the contribution of procedural long-term memory to working memory by focusing mostly on the temporary maintenance of declarative information. Many dual-task studies have shown that recall from working memory suffers more when the encoding and/or the retention interval is filled with a task that competes for the same resources. This competition can involve storage (when the task uses the same storage modalities as the memory task) or attention (when the task calls on the same attentional or executive resources as the memory task). Within most working memory models, storage overlaps are accounted for by a competition for the same declarative encoding system, whereas executive overlaps are accounted for by a competition for the same executive or attentional system. However, an alternative view is possible, namely that in both cases whether and to which extent there will be overlaps depends on the usage of procedural knowledge retrieved from long-term memory. According to a recently proposed adaptation of the multicomponent view on working memory [Vandierendonck, A. (in press). A working memory system with distributed executive control. Perspectives on Psychological Science.], procedural long-term memory is included as a core part of working memory functioning. According to this view, not only task execution, but also encoding and retrieval of information in working memory depends on the procedures used. The present talk will further elaborate this view to show how encoding and retrieval strategies accumulated in pLTM contribute to memorisation efficiency and also help to manage potential overlaps that may arise in a dual-task context.

Symposium

Executive control in affective contexts: evidence from healthy, clinical and paediatric populations

S. Schweizer[1], N. Derakhshan[2], S. Wass[2], N. Moyal[3]

[1]Cambridge UK, MRC Cognition and Brain Sciences Unit, United Kingdom
[2]Birkbeck University of London, Deptartment of Psychological Sciences, United Kingdom
[3]Ben-Gurion University of the Negev, The Cognitive Neuroscience Lab, United Kingdom

Executive control (EC), our ability to attend and respond to goal-relevant information, while inhibiting pre-potent responses and attention to distracting material, is a critical capacity across a wide range of cognitive functions. Yet, despite the fact that our everyday environments frequently require these cognitive functions to be performed in affective contexts – much of the goal-relevant as well as distracting information we process has affective characteristics – the affective dimension has typically been ignored and EC has been assessed in valence-neutral contexts. The past decade, however, has seen an exponential increase in studies investigating EC in affective contexts across a range of populations (healthy and clinical). The proposed symposium presents research on EC in affective contexts, its behavioural, neural and psychophysiological correlates in healthy individuals, infants, and clinical populations (including patients with depression and posttraumatic stress disorder). To provide an initial overview findings from both a behavioural and a neuroimaging meta-analytic review of the effects of affective memoranda and distractors on EC will be presented discussing the role of potential moderating factors such as valence and psychopathological status. Next a series of experiments investigating in the role of processing mode – implicit versus explicit – on the effects of affective versus neutral distractors on EC will be explored. The symposium will then present a number of studies exploring patterns of EC in affective contexts in individuals suffering from depression and posttraumatic stress disorder. Early markers of such an association will be explored in a programme of research in infants showing the association between EC and their psychophysiological and affective responses to a mild stressor (video of another infant in mild distress). Finally, the symposium will close be presenting findings from studies investigating training interventions that can address EC difficulties in affective contexts.

Symposium Abstracts　　　　　　　　　　　　　　　**09:00 – 09:20**

Affective working memory capacity in healthy individuals and those suffering from psychopathology

S. Schweizer[1], T. Dalgleish[1]

[1]MRC Cognition and Brain Sciences Unit, Cognition, Emotion and Mental Health Programme, United Kingdom

In this talk executive control is operationalized as Working Memory Capacity (WMC), which refers to individuals' ability to attend to goal-relevant information, while inhibiting attention and pre-potent responses to distracting stimuli. We will discuss how WMC is impacted by affective contexts based on insights from a metaanalytic investigation and recent work using affective complex span tasks in both healthy individuals and those suffering from psychopathology (specifically depression and posttraumatic stress disorder). Finally, we will address the possibility of improving affective WMC through training paradigms.

Symposium Abstracts

How may cognitive control training increase resilience in psychopathology?

N. Derakhshan[1]

[1]Birkbeck University of London, Department of Psychological Science, United Kingdom

Trait vulnerability to emotional disorders such as anxiety and depression is becoming increasingly associated with deficits in the flexibility and regulation of cognitive control processes of working memory with recent theoretical positions arguing for a causal role of cognitive control in the onset, maintenance and recurrence of these disorders. Accumulating evidence shows that cognitive control can be increased through adaptive and structured working memory training techniques targeting working memory capacity, with transfer effects to performance on untrained cognitive tasks as well as reductions in self-reported symptomatology of emotional vulnerability. This talk will discuss recent developments attempting to increase cognitive flexibility and control in trait vulnerable individuals prone to anxiety and depression, promoting resilience and psychological strength. The talk will ighlight the promise and challenges of adaptive techniques targeting working memory capacity in increasing processing efficiency, attentional control and resilience in at risk individuals and outline possible ways whereby changes in attentional control can be maintained across time.

Symposium Abstracts

Stress reactivity is positively associated with encoding speed and recognition memory in typical 12-month old infants

S. Wass[1], K. de Barbaro[1], K. Clackson[1]

[1]MRC Cognition and Brain Sciences Unit, Executive Processes Group, United Kingdom

A large literature indicates that, during infancy, shorter looking durations to novel objects, and better visual recognition memory, predict superior long-term cognitive outcomes. The developmental neurobiological mechanisms underlying these longitudinal relationships remain, however, poorly understood. Here we examined the relationship between stress reactivity (infants' heart rate response to watching videos of another child crying) and infant performance on measures of looking duration and visual recognition memory. Our findings indicate that infants with increased stress reactivity showed shorter look durations and enhanced recognition memory. Thus, intriguingly, patterns of higher stress reactivity in infants were associated with behaviours consistent with superior long-term cognitive outcomes. Possible developmental mechanisms subserving these relationships are discussed.

Symposium Abstracts

<div style="float:right">**10:00 – 10:20**</div>

The Effect of Processing Type on the Interaction between Emotion and Executive Control

N. Moyal[1], N. Cohen[1], L. Lichtenstein-Vidne[1], A. Henik[2]

[1]Ben-Gurion University of the Negev, Department of Psychology and the Zlotowski Center for Neuroscience, Israel
[2]Ben-Gurion University of the Negev, Psychology, Israel

The interaction between emotion and executive control is evident both in psychological studies and in daily life. Our emotions have a major influence on our behavior, and the interaction between emotion and executive control is evident in various psychological studies. Previous studies have shown that recruitment of executive control (e.g., by using an incongruent stimulus) reduces the influence of emotional stimuli. In the current study we examined the influence of processing type (i.e., explicit vs. implicit) of emotional stimuli on the interaction between emotion and executive control. Participants were presented with a negative or neutral picture, which preceded a flanker task. Following the flanker task, a discrimination task was presented. In the first experiment, we asked half of the participants to respond to an emotional aspect of the stimulus (i.e., explicit processing). The other half of the participants were asked to respond to a neutral aspect of the stimulus (i.e., implicit processing). In the second experiment, participants were asked to respond to a neutral, unrelated task (passive view). Both the explicit processing and the passive view resulted in interaction between emotion (negative vs. neutral) and congruity (congruent vs. incongruent trial). More specifically, incongruent trials resulted in decreased emotional interference compared with the congruent trials. However, when the pictures were implicitly processed, emotional interference was evident both in congruent and incongruent trials. These results imply that the way individuals process emotional information has a great influence.

Symposium

Current trends in associative learning

A. Kiesel[1], C. Pfeuffer[2], [2], K. Moutsopoulou[3], A. Horner[4], B. Liefooghe[5], H. Ruge[6]

[1]University of Freiburg, Department of Psychology, Germany
[2]University of Wuerzburg, Department of Psychology, Germany
[3]Universite Paris Descartes, CNRS (Laboratoire Psychologie de la Perception, UMR 8158), France
[4]University College London, Institute of Cognitive Neuroscience, United Kingdom
[5]Ghent University, Department of Experimental-Clinical and Health Psychology, Belgium
[6]TU Dresden, Professur fur Allgemeine Psychologie, Germany

Stimulus-response associations, rapidly formed by the co-occurrence of even arbitrary pairings of stimuli and responses, have been regarded as a basis of associative learning for several decades. Now various recent findings challenge established views of associative learning suggesting that mere S-R learning might be too simplistic. For instance, task-switching research has shown that stimuli are associated with both their specific responses as well as the current task, allowing for task-specific behavioral adaptation. Furthermore, stimulus-response associations can be formed by instruction only suggesting that responding is not essential for the formation of stimulus-response associations. In contrast, reward settings and intentions, for instance, might play a crucial role for the strength of the formed associations. Given the various challenges the traditional concept of associative learning is currently subjected to, this symposium aims at exemplifying current trends in associative learning and putting them in a broader context.

Symposium Abstracts

Words Suffice - Exploring instructed stimulus-response associations

C. Pfeuffer[1], K. Moutsopoulou[2], F. Waszak[1], A. Kiesel[2]

[1]University of Freiburg, Department of Psychology, Germany
[2]Universite Paris Descartes, CNRS, Germany

Previous studies on item-specific priming have established the independence of two distinct components of acquired stimulus-response associations: Stimulus-Action (S-A) and Stimulus-Classification (S-C) associations. Here we demonstrate that merely instructing S-A and S-C mappings leads to associative learning and influences later behavior. More specifically, we demonstrate that item-specific switches in S-A and S-C mappings between a prime and a later corresponding probe independently affect reaction time and accuracy both when participants act upon prime stimuli as well as when participants are merely instructed about actions and classifications mapped to stimuli during prime trials. The present experiments are the first to show that both S-A and S-C associations can be instantiated by mere instruction, allowing for optimal behavioral flexibility. Furthermore, we demonstrate that even instructions without action relevance or intention of later use affect participants´ subsequent behavior. The boundary conditions of these instruction-based effects are explored in several experiments.

Symposium Abstracts

Automatically acquired stimulus-response associations and the lifespan of their component processes

K. Moutsopoulou[1, 2], A. Kiesel[3], C. Pfeuffer[2], F. Waszak[1, 3]

[1]Universite Paris Descartes,, Sorbonne Paris Cite, Paris, France
[2]CNRS Laboratoire Psychologie de la Perception, UMR 8242, Paris, France
[3]University of Freiburg, Department of Psychology, Germany

Stimulus-Response (S-R) learning incorporates at least two component processes: the level of task performance on the stimulus (e.g. to classify a visual object as being large or small; Stimulus-Classification or S-C association) and the action itself performed to indicate the response to the task (e.g. a left key press to indicate that the object is small; Stimulus-Action or S-A association). These effects have been studied in a paradigm where stimuli are presented within one classification task (e.g. the size task) and require one action as a response (a left or right key press). Then, these stimuli are presented again within a few trials (less than 10 trials later) and without any explicit instructions given to the participants in relation to the particular associations, the task and/or action is switched/repeated (orthogonally in relation to the associations created during the first presentation of a stimulus). Using this paradigm and measuring reaction times, it has been shown that both S-C and S-A associations affect behaviour but do not interact during retrieval and instead have independent, additive effects. Here we investigated how long these associations last and whether both the high level task association and lower level motor association affect behaviour hours and days after acquisition. This was done by testing the associations within different lags between acquisition and test. We found that these two independent components of S-R learning show different retrieval patterns across time. This finding raises the issue of which memory processes underlie these distinct S-R components.

Symposium Abstracts

09:40 – 10:00

Retrieval of bindings between task-irrelevant stimuli and responses can facilitate behaviour under conditions of high response certainty

A. Horner[1]

[1]University College London, Institute of Cognitive Neuroscience, United Kingdom

Repetition priming can be driven by the encoding and retrieval of stimulus-response (S-R) bindings. When a previously encoded S-R binding is retrieved, and is congruent with the response currently required, it can bias response-selection processes towards selecting the retrieved response, resulting in facilitation. Previous studies have used classification tasks at retrieval. Here, two (or more) response options are competing and it is likely that any evidence (e.g., an S-R binding) in favour of one option will be utilised to effect a decision. Thus, S-R effects are likely to be seen when using such a task. It is unclear whether such effects can be seen under conditions of higher response certainty, when participants are explicitly cued to make a response. Across two experiments, evidence for a modulating influence of S-R bindings is seen despite using a response cuing method at retrieval to minimise response uncertainty and despite stimuli being task-irrelevant. Finally, the results suggest that responses within these S-R bindings are coded at the level of left vs. right hand, and not a more fine-grained within-hand thumb vs. index-finger. The results underline the resilience of S-R effects, suggesting they are present even under conditions where no explicit object-oriented decision is required.

Symposium Abstracts   10:00 – 10:20

Instruction-based formation of associations: How far can we go?

B. Liefooghe[1]

[1]Ghent University, Dep. of Experimental-Clinical and Health Psychology, Belgium

In recent years, a substantial amount of research focused on the implementation of instructions into actions. A common finding in this field of research is that instructed stimulus-response (S-R) mappings, that were not applied overtly before, can lead to response compatibility effects. An overview will be presented about the current status of our research on this type of effect. First, evidence will be discussed, which suggest that instruction-based congruency effects are based on the implementation of S-R mappings into actively maintained associations, which lead to automatic response activations. Second, evidence will be presented indicating that instruction-based congruency can also be obtained for instructed response-effect contingencies. A result suggesting that associations formed on the basis of instructions allow for backward activation. Third, it will be demonstrated that instruction-based congruency can be extended beyond instructed S-R mappings, by focusing on different types of instructions, such as No-Go instructions and Cue-to-Task mappings.

Symposium Abstracts

The neural signature of encoding and implementing instructed novel and reversed stimulus-response associations

H. Ruge[1], U. Wolfensteller[1]

[1]Technische Universitat Dresden, Psychology, Germany

The ability to quickly learn to modify or even reverse previously acquired stimulus-response (S-R) associations is a key element of behavioral flexibility. In the standard paradigm, S-R reversal learning is driven by feedback where changed response requirements are determined retrospectively depending on whether or not an executed response yielded reward. Alternatively, S-R reversal can be learned by verbal instruction or observation of others' performance which informs prospectively about the changed response requirements to gain reward in a particular stimulus condition. Brain imaging studies on reversal learning have so far exclusively focused on feedback-driven learning processes and imaging studies on instructed learning have exclusively focused on the initial acquisition of novel rules but not on the instructed reversal of previously acquired rules. The present study hence addressed three unresolved issues. (1) Is instructed reversal learning characterized by a similar neural signature as feedback-driven reversal learning? (2) Is there a difference to the instructed initial learning of novel rules? (3) Can we disentangle primary reversal-related encoding processes themselves from secondary reversal-related control processes that enable the (memory-based) implementation of the reversed rules under competition from the initially learned rules? The results suggest that (1) similar brain regions support both feedback-driven and instructed reversal learning, including most prominently the lateral orbitofrontal cortex (OFC). (2) The lateral OFC is relevant for the instructed encoding of both initial rules and reversed rules whereas the dorsal caudate nucleus seems to exclusively support the encoding of reversed rules. Encoding-related activation in both regions predicts resilience against response competition during subsequent memory-based reversal implementation (3) Secondary reversal-related control processes are reflected by distinctly different activation effects in a more widespread set of fronto-parietal brain regions and are modulated by inter-individual differences in goal neglect.

Symposium

The cognitive effects of bilingualism

E. Woumans[1], W. Duyck[1], E. Struys[2], A. Costa[3], J.A. Dunabeitia[4], A. de Bruin[5]

[1]Ghent University, Department of Psychology, Belgium
[2]Vrije Universiteit Brussel, Department of Linguistics, Belgium
[3]Universitat Pompeu Fabra, ICREA, Spain
[4]Basque Center on Cognition, Brain, and Language, BCBL, Spain
[5]University of Edinburgh, School of Philosophy, Psychology, and Language Sciences, United Kingdom

The past couple of decades have provided us with a myriad of studies demonstrating that bilingualism is beneficial for cognitive functioning. Bilinguals appear to outperform their monolingual peers on different types of cognitive control tasks, such as the Simon and the flanker task. Moreover, they seem to develop their cognitive abilities faster during childhood and retain them longer in older age. It is thought that controlling two languages trains the general mechanisms of control, hereby generating these advantages. Still, how language control modulates the general mechanisms of control it not yet well-understood. Neither is it clear whether bilingualism itself causes these advantages or rather specific aspects of the bilingual experience. Hence, this symposium will focus on which mechanisms of language control and cognitive control overlap. In this perspective, Calabria, Cattaneo, and Costa will discuss the nature of this cross-talk, looking at both behavioral and neuropsychological data from both healthy individuals and patients. In addition, Dunabeitia et al. will present how exactly bilingualism shapes cognitive abilities throughout the entire lifespan, but will also suggest that the bilingual advantage is not always found in all populations. Additionally, this symposium will examine the cognitive effects of different bilingual parameters. De Bruin et al. will present their findings on the influence of active and inactive bilingualism, and will also review their recent metaanalysis of the bilingual advantage. The presentation by Struys et al. will provide a neuroimaging perspective on how language switching, another important linguistic parameter, affects cognitive control. Furthermore, Woumans et al. will focus on different aspects of the bilingual experience and discuss how these relate to cognitive functioning in bilingual populations of all ages.

Symposium Abstracts

09:00 – 09:20

On the cross-talk between language and executive control in bilinguals

M. Calabria[1], G. Cattaneo[1], A. Costa[1], [2]

[1]University Pompeu Fabra, Center for Brain and Cognition, Spain
[2]ICREA, Institucio Catalana de Recerca i Estudis Avancats, Spain

In the context of bilingualism, there is a general agreement that the underlying mechanisms of language control and general-domain executive control are overlapping. However, the nature of such mechanisms which are shared between these two systems is not completely understood. In this perspective, to investigate the nature of this cross-talk we looked at both behavioral and neuropsychological data. Data from healthy individuals show that transient mechanisms of control of language are mostly independent from those of the generaldomain executive control. However, data from bilingual patients with neurodegenerative disease show that sustained mechanisms of both systems get impaired in a similar way, suggesting that the link between language and executive control would be at this level.

Symposium Abstracts

09:20 – 09:40

Examining the effects of active versus inactive bilingualism on executive control in a carefully matched non-immigrant sample

A. de Bruin[1], T.H. Bak[1], S. Della Sala[1]

[1]University of Edinburgh, Psychology, Human Cognitive Neuroscience, United Kingdom

Although many studies have suggested that bilinguals have a cognitive advantage compared to monolinguals (e.g., Bialystok et al., 2004), recent studies have challenged the robustness or even existence of this effect (e.g., Paap & Greenberg, 2013). In this talk, we will firstly discuss the results of our meta-analysis (de Bruin et al., 2015) examining a publication bias in the literature on bilingualism and executive control. Comparing publication chances of results presented in conference abstracts showed that data supporting a bilingual advantage were more likely to be published than data challenging an advantage. Secondly, we will present a recent study examining the effects of language use on executive functioning. We compared groups of bilinguals and monolinguals that were carefully matched on background variables including immigrant status. All Gaelic-English bilinguals had acquired both languages during their childhood. Whereas some bilinguals ('active bilinguals') continued to use both languages during their later life, others ('inactive bilinguals') only or mainly used English. The Simon arrow task showed no effect of bilingualism on overall RTs or the Simon effect (taken as a measurement of interference suppression). The task-switching paradigm showed no effect of bilingualism on overall RTs or mixing costs. Active, but not inactive, bilinguals showed smaller raw switching costs than monolinguals, but this effect disappeared when corrected for baseline differences. These findings, combined with the meta-analysis, show that the effects of bilingualism are not as robust as previously claimed. Although we did not find executive control differences between active and inactive bilinguals, language tests showed the need to define language use and proficiency in bilinguals when examining executive control.

Symposium Abstracts

How does bilingualism shape non-linguistic cognitive abilities across lifespan?

J.A. Dunabeitia[1], M. Carreiras[1, 2]

[1]Basque Center on Cognition, Brain and Language, BCBL, Spain
[2]Ikerbasque, Basque Foundation for Science, Spain

Last decades have witnessed an increasing body of evidence suggesting that the benefits associated with bilingualism go beyond the limits of communication and social interactions, extending to domain-general cognitive functions such as executive functions, among others. However, recent evidence demonstrates that this so-called bilingual advantage may not generalize to all bilingual communities or samples, indicating that the seemingly positive effects of bilingualism on general cognitive mechanisms may not be as pervasive as initially thought. We will present data from a series of behavioral and neuroimaging studies testing how native Spanish-Basque balanced bilinguals perform on tasks tapping into executive functions, and compare these results to those obtained from Spanish monolingual groups. In detail, we will present data obtained in studies testing the effects of bilingualism on non-linguistic cognitive skills during childhood, youth and the elderly. Our results do not support the so-called bilingual advantage, and these data will be discussed within a recent general framework that questions the existence and degree of generalization of the differential effects between monolinguals and bilinguals in tasks requiring adaptability of the cognitive system and inhibition skills.

Symposium Abstracts

A neuroimaging perspective on the interaction between language switching skills and cognitive control in bilingual populations

E. Struys[1], M. van den Noort[2], [3]

[1]Vrije Universiteit Brussel, TALK, Belgium
[2]Vrije Universiteit Brussel, Brussels Institute of Applied Linguistics, Belgium
[3]Kyung Hee University, Research Group of Pain and Neuroscience, South Korea

The presence of bilingual advantages in cognitive control has become a controversial issue. Research has increasingly focused on the variability within bilingual populations. It was found that language switching skills are an important predictor of behavioral measures of cognitive control in bilinguals. We report the results on the neural aspects of the interaction between language switching skills and cognitive control. Twenty-five young bilingual adults were enrolled. First, several specific language tasks and a language switching verbal fluency task were conducted in the first (Dutch) and second (French) language, all outside the MRI scanner. Then, a mixed-language semantic categorization task (i.e., a language control task) and a Simon task (i.e., a cognitive control task) were conducted inside the 3 Tesla MRI (Philips Achieva) scanner. Based on the performance on the mixed-language verbal fluency task, a distinction was made between high- and lowproficient language switchers. The behavioral results showed that language-switching proficiency significantly predicted response times on the Simon task. The neuroimaging results showed additional neural activity in the left dorsolateral prefrontal cortex for high-proficient language switchers, both on the first language-to-second language switch trials of the mixed-language semantic categorization task and on the incongruent trials of the Simon-task. To conclude, our study adds a neuroimaging perspective to previous research on the interaction between language switching skills and cognitive control in bilingual populations. In language and cognitive control tasks alike, high-proficient language switchers score better than low-proficient language switchers and they additionally recruit one specific component of the neural control network. Future studies are needed to further investigate whether those differences can be explained by the patterns of language use or by the frequency of language switching.

Symposium Abstracts   **10:20 – 10:40**

Cognition throughout the lifespan: Power of the bilingual experience

E. Woumans[1], W. Duyck[1]

[1]Ghent University, Department of Psychology, Belgium

There have already been a myriad of studies on bilingualism and cognitive control. While most of them seem to find effects in favour of bilinguals (i.e. 'the bilingual advantage'), some report no effects at all. The discrepancy might lay in different confounding variables, such as socioeconomic status or certain linguistic parameters. In order to address this issue, we carried out four separate studies, in which we assessed the bilingual cognitive advantage across the lifespan, taking into account factors that may influence its development. In the first study, we set up a longitudinal field design among two groups of 5-year-old children to determine how acquiring a second language influences cognitive development. One group attended monolingual kindergarten, whereas the other was enrolled in an L2 immersion programme, with L2 instruction for 50% of the time. Both groups were matched at baseline (before L2 immersion started) for both cognitive and linguistics skills. We found that after a year of schooling, the immersion children actually gained IQ points, while the monolinguals did not. In the second and third study, we aimed at identifying how specific bilingual experiences, such as language switching frequency,/proficiency and interpreter training, contribute to the advantage. We found that only bilinguals who report frequent language switching display the bilingual advantage. We also found a correlation between switching proficiency and the conflict effect in a version of the Simon task. Furthermore, it appeared that interpreter training also contributes to cognitive control. In the fourth and final study, we compared the onset and diagnosis age of Alzheimer's disease in a non-immigrant bilingual and monolingual patients and found that disease manifestation is delayed with 4-5 years in bilinguals. Hence, these studies underline the importance of different variables that may modify the magnitude of the bilingual effect.

Symposium

Social antecedents and consequences of action control

A. van der Weiden[1], B. Hommel[2], W. Kunde[3], G. Knoblich[4], B. Muller[5]

[1]University Medical Center Utrecht - Brain Center Rudolf Magnus, Psychiatry, Netherlands
[2]Leiden University, Cognitive Psychology, Netherlands
[3]University of Wurzburg, Psychology, Germany
[4]Central European University, Cognitive Science, Hungary
[5]Radboud University Nijmegen, Social and Cultural Psychology, Netherlands

People rarely act in social isolation. Whether simply surrounded by others or actually interacting, the actions we perform are strongly affected by the people around us. With this symposium we gathered researchers with backgrounds in Social, Cognitive, Developmental, and Neuro-Psychology who focus on different aspects of action control in social contexts. Specifically, the present symposium focuses on research addressing a) how people plan and perform actions in coordination with others, b) what developmental and neural processes are involved in social (e.g., human versus non-human) action perception, c) and how action control affects social perception (e.g., experience of agency) and behavior (e.g., conformity). Bringing together these different lines of research on action control will deepen our understanding of the social antecedents and consequences of action control and will help to mutually stimulate new research questions.

Symposium

Symposium Abstracts

Socio-motor action control

W. Kunde[1], R. Pfister[1], O. Herbort[1]

[1]University of Wuerzburg, Psychology III, Germany

Humans store and retrieve motor actions by codes of the perceptible consequences that these actions consistently produce. This is the tenet of so called ideo-motor approaches to action control. What we do, however, has consequences not only in the inanimate environment, but at social partners around us. Sometimes such social consequences are intended, and sometimes they are not, but happen consistently nevertheless. Do such social consequences constrain our action and perception so as consequences in the inanimate environment? I will present some observations suggesting so, thereby supporting the idea of "sociomotor" action control. I will also discuss some peculiarities that should likely be taken when into account when studying the impact of social compared to less social action feedback.

Symposium Abstracts

Identity and space: How people distinguish between own and others' actions depends on social context

A. van der Weiden[1], R. Liepelt[2]

[1]University Medical Center Utrecht - Brain Center Rudolf Magnus, Psychiatry, Netherlands
[2]University of Muenster, Psychology, Germany

In social interactions, people are able to distinguish self and other by coding their own actions in reference to their interaction partner. For example, people spatially code their actions as 'left' when sitting to the left of their interaction partner, and vice versa. This spatial coding is commonly measured using the social Simon task, in which participants respond to stimuli that are spatially congruent or incongruent to their seating arrangement, resulting in slowed reaction times (action interference) when incongruent. Recent research showed similar action interference effects as a function of color or identity congruency, raising the question when and how people use different reference frames (e.g., space, identity) to code their actions? Based on the notion that spatial action interference is increased when interacting with similar compared with dissimilar others, we propose that people more easily code and distinguish their actions in reference to non-personal (e.g., spatial) characteristics when interacting with similar others. Yet, when interacting with dissimilar others, people more easily code their actions in reference to personal (e.g., identity) characteristics, which should lead to enhanced identity interference. To test this hypothesis, we developed a multi-dimensional social Simon task, in which participants responded to blue or orange words. These words were either their own name, their co-actor's name, or a no name control condition (identity dimension), and were presented either on the left, middle, or right of a computer screen (spatial dimension). Perceived similarity between co-actors was manipulated through a minimal group paradigm, creating in-group and out-group participant pairs. Results showed strong spatial and identity interference effects. In contrast to previous research, spatial interference was unaffected by perceived group membership. However, identity interference was enhanced when interacting with dissimilar compared with similar others, indicating that depending on the social context humans use various reference frames to code their actions.

Symposium Abstracts

Sense of Agency in Joint Action

G. Knoblich[1]

[1]Central European University, Cognitive Science, Hungary

When two individuals perform joint actions together they produce joint action outcomes that can be difficult to attribute to individual actions. This is particularly true for joint actions where different individuals synchronously perform the same or different actions. Examples are lifting boxes, riding tandems, pushing cars, or saying prayers. What determines how much control individual actors feels over joint action outcomes? Does individuals' sense of agency of joint action outcomes reflect a veridical estimate of individual contributions to performance or does it depend on whether the joint action is successful? Does an individual's role in a joint action and the type of interaction modulate the sense of agency over joint action outcomes? I will provide an overview of recent experiments addressing these questions. The results indicate that the sense of agency for joint action outcomes can deviate from the actual and the perceived individual contributions to joint action outcomes. One possible interpretations of these results is that the sense of agency depends more on a monitoring of joint action outcomes than on a monitoring of individual contributions to joint action.

Symposium Abstracts

An Event-Based Account of Conformity

D. Kim[1], B. Hommel[2], [3]

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[3]Leiden Institute for Brain and Cognition, LIBC, Netherlands

People often change their behavior and beliefs when confronted with deviating behavior and beliefs of others, but the mechanisms underlying such phenomena of conformity are not well understood. We suggest that people cognitively represent their own actions and others' actions in comparable ways (Theory of Event Coding; Hommel, Musseler, Aschersleben & Prinz, 2001), so that they may fail to distinguish these two categories of actions. If so, other people's actions that have no social meaning should induce conformity effects, especially if those actions are similar to one's own actions. We indeed found that female participants adjusted their manual judgments of the beauty of female faces in the direction consistent with distracting information without any social meaning (numbers falling within the range of the judgment scale) and that this effect was enhanced when the distracting information was presented in videos showing the actual manual decision-making acts. These results confirm that similarity between an observed action and one's own action matters. We also found that the magnitude of the standard conformity effect was statistically equivalent to the movie-induced effect.

Symposium Abstracts   10:20 – 10:40

Affective matching of odors and facial expressions in infants: Shifting patterns between 3 and 7 months

O. Godard[1], K. Durand[1], B. Schaal[1], J. Baudouin[2]

[1]Universite de Bourgogne, Centre des Sciences du Gout et de l'Alimentation (CNRS), France
[2]University of Burgundy, Psychology, France

Recognition of emotional facial expressions is a crucial skill for adaptive behavior. Past research suggests that at 5 to 7 months of age, infants look longer to an unfamiliar dynamic angry/happy face which emotionally matches a vocal expression. This suggests that they can match stimulations of distinct modalities on their emotional content. In the present study, olfaction–vision matching abilities were assessed across different age groups (3, 5 and 7 months) using dynamic expressive faces (happy vs. disgusted) and distinct hedonic odor contexts (pleasant, unpleasant and control) in a visual-preference paradigm. At all ages the infants were biased toward the disgust faces. This visual bias reversed into a bias for smiling faces in the context of the pleasant odor context in the 3-month-old infants. In infants aged 5 and 7 months, no effect of the odor context appeared in the present conditions. This study highlights the role of the olfactory context in the modulation of visual behavior toward expressive faces in infants. The influence of olfaction took the form of a contingency effect in 3-month-old infants, but later evolved to vanish or to take another form that could not be evidenced in the present study. Several hypotheses are proposed on how such olfacto-visual intersensory abilities can come to be specified so early.

Symposium

How emotion and motivation influence cognitive control

K. Frober[1], M. Katzir[2]

[1]University of Regensburg, General Psychology, Germany
[2]Ben Gurion University, Psychology, Israel

Cognitive control processes are necessary for adaptive behavior in an environment with dynamically changing demands. A lot of research over the past few years was specifically aimed to investigate how emotional and/or motivational manipulations modulate cognitive control. Emotions play an important role in self-regulation either by signaling progress on desired end states, or by becoming desired end states themselves. Rewards, too, represent desired end states associated with positive affect, and were found to substantially influence cognitive control. Interestingly, recent results revealed very specific and distinct influences of positive affect and reward on cognitive control (see reviews by Chiew & Braver, 2011, and, Goschke & Bolte, 2014). It seems that emotional manipulations (direct induction of positive affect) and motivational manipulations (performance contingent reward, or the consideration of positive emotions) bias the cognitive system in different ways. This symposium brings together leading experts presenting current research on emotional and motivational modulation of cognitive control.

Symposium Abstracts

09:00 – 09:20

Go with the flow: How the consideration of joy versus pride influences Automaticity

M. Katzir[1], B. Ori[1], T. Eyal[1], N. Meiran[1]

[1]Ben Gurion University, Psychology, Israel

Recently, we have shown that the consideration of joy, without the actual experience of the emotion, impaired performance on the antisaccade task (Katzir, Eyal, Meiran, & Kessler, 2010). We interpreted this finding as indicating inhibitory control failure. However, impaired antisaccade performance may result from either the weakening of inhibitory control, the potentiation of the competing automatic response, or both. In the current research we used a task switching paradigm, which allowed us to assess cognitive control more directly, using Backward Inhibition, Competitor Rule Suppression, and Competitor Rule Priming as cognitive-control indices as well as assessing the Task Rule Congruency Effect (TRCE) which, like the antisaccade, is influenced by both control and automaticity. We found that considering joy compared to pride did not influence any of the cognitive control indices but increased the TRCE. We interpret this finding as evidence that joy consideration leads to increased reliance on automatic tendencies, such as short-term desires.

Symposium Abstracts

Conflict adaptation in positive and negative mood: Comparing the effects of different mood inductions

S. Schuch[1], J. Zweerings[1], P. Cichecki[1], I. Koch[1]

[1]RWTH Aachen University, Institute of Psychology, Germany

Conflict adaptation is a cognitive mechanism denoting increased cognitive control upon detection of conflict. This mechanism can be measured by the ''congruency sequence effect'', indicating the reduction of congruency effects after incongruent trials (where response conflict occurs) relative to congruent trials (without response conflict). A number of studies have recently reported influences of mood state on conflict adaptation, with increased conflict adaptation under negative, as compared to positive, mood (e.g., Schuch & Koch, 2014; van Steenbergen, Band & Hommel, 2010). In these studies, sustained mood states were induced by film clips or music in combination with imagination techniques. Here, we report two further sets of experiments, where mood states were induced by success-failure manipulations. In one set of experiments, participants received success or failure feedback on a social perception task prior to the assessment of conflict adaptation. In another set of experiments, participants received success or failure feedback on their performance during the practice trials prior to the assessment of conflict adaptation. Interestingly, these slight changes in mood induction procedure flipped around the mood-based influence on conflict adaptation: While in the former set of experiments, we partly replicated the finding of increased conflict adaptation under negative mood, in the latter set of experiments, we observed reduced conflict adaptation under negative, relative to positive, mood. We suggest that these data patterns reflect differences in motivational states. For instance, the negative performance feedback during practice might have provided an incentive to put more effort into the task, thereby overruling the influence of negative mood induced by the negative feedback manipulation. The results are discussed with respect to current theories on the interplay of motivational and emotional influences on cognitive control.

Symposium Abstracts

The Effect of Positive Affect on Conflict Control: Modulated by Approach Motivational Intensity

Z. Wang[1], Y. Liu[1]

[1]Shaanxi Normal University, School of Psychology, China

The motivational dimensional model of affect proposes that the influence of positive affect on cognitive processing is modulated by approach motivational intensity. The present research extended this model by examining the influence of positive affect varying in approach motivational intensity on conflict control—the ability to resist or resolve interference from task-irrelevant distractors in order to focus on the target. The global-local task (Experiment 1) and letter-Flanker task (Experiment 2) were used to measure conflict control. Results showed that, relative to neutral state, low approach-motivated positive affect caused higher, whereas high approach-motivated positive affect caused smaller global-to-local interference and response conflict on the Flanker task. These findings indicate that whatever conflict control is situated at the perceptual or response stage, the influences of positive affect on conflict control are modulated by approach motivational intensity.

Symposium Abstracts   10:00 – 10:20

Considerations in the investigation of positive emotion and reward influences on cognitive control

K. Chiew[1], T. Braver[2]

[1]Duke University, Center for Cognitive Neuroscience, United States
[2]Washington University in St. Louis, Psychology, United States

Affective influences can contribute strongly to goal-oriented behaviour, but the mechanisms by which these influences shape cognition continue to be investigated. Recent research has sought to characterize effects of positive emotion (i.e., valenced subjective experience) and reward motivation (e.g., performance-contingent incentives) on cognitive control to determine whether these influences are dissociable. Using task performance and pupillometry, we investigated positive emotion and reward effects on cognitive control dynamics (Chiew & Braver, 2014). Consistent with past evidence, we observed increased proactive control and preparatory pupil activity under reward motivation. Positive emotion, which previously has led to mixed results on control dynamics, was also associated with a small increase in proactive control. Analyses of individual differences suggested that reward responsivity was related to incentive-related changes in response, but individual difference analyses on performance under positive emotion suggested the presence of more complex relationships. In this talk, we discuss methodological considerations in this and other studies comparing positive emotion and reward influences on cognitive control, possible experimental confounds, and future directions for this line of research inquiry.

Symposium Abstracts   10:00 – 10:20

Symposium Abstracts

How sequential changes in reward magnitude modulate cognitive flexibility: Evidence from voluntary task switching

K. Frober[1], G. Dreisbach[2]

[1]University of Regensburg, General Psychology, Germany
[2]University of Regensburg, Experimental Psychology, Germany

There is much evidence that the prospect of reward modulates cognitive control in terms of more stable behavior. Increases in expected reward magnitude, however, have been suggested to increase flexible behavior as evidenced by reduced switch costs. In a series of experiments, we will provide first evidence that this increased cognitive flexibility following increases in reward magnitude also promotes deliberate task switching. A modified task switching paradigm with forced- and free-choice trials and varying reward prospects was used. In Experiments 1, 2a and 2b the prospect of a reward increase as compared to unchanged high reward increased voluntary switching rate (VSR). Experiment 3 showed that the prospect of a reward decrease did not alter VSR as compared to unchanged low reward. Experiment 4 used a standard voluntary task switching procedure and confirmed VSR effects found in Experiments 1 to 3. These findings are strong evidence for a mechanism that biases the cognitive system either towards stability or flexibility depending on changing reward expectation. Results will be discussed within the framework of the adaptive gain theory.

Symposium   09:00 – 11:00 | Amoroza B – C

Modulating the social brain via transcranial Direct Current Stimulation (tDCS)

R. Sellaro[1], R. Liepelt[2], P. Riva[3], C. Civai[4], L. Bardi[5]

[1]Leiden University, Cognitive Psychology Unit, Netherlands
[2]University of Muenster, Institute for Psychology, Germany
[3]University of Milano-Bicocca, Department of Psychology, Italy
[4]Radboud University Nijmegen, Donders Institute for Brain, Cognition and Behaviour, Netherlands
[5]Ghent University, Department of Experimental Psychology, Belgium

Over the last decades, we have witnessed an explosive advancement in non-invasive technologies for interacting in a safe and painless way with the brain and inducing direct and indirect changes in cortical excitability. Among these techniques, transcranial direct current stimulation (tDCS) has become recognized as a promising tool in cognitive neuroscience research for understanding the causal contribution of a given brain area and/or promoting behavioural change for the better. Several studies have provided converging evidence showing that tDCS is suited to modulate cognitive functions and to ameliorate symptoms of several neurological and psychiatric disorders. By comparison, only a limited number of studies has assessed the effects of tDCS on social cognition. Notwithstanding the paucity of research in this area, there is sufficient evidence to foresee the potential of this technique to influence social functioning and social decision-making. This symposium intends to provide a first overview of some of the currently available findings in order to gain a better understanding of the potential of tDCS for making an unique contribution to the field of social cognition.

Symposium Abstracts

Reducing prejudice through brain stimulation

R. Sellaro[1], B. Derks[2], M. Nitsche[3], B. Hommel[3], W. van den Wildenberg[4], K. van Dam[4], L. Colzato[4]

[1]Leiden University, Cognitive Psychology Unit, Netherlands
[2]Utrecht University, Social & Organisational Psychology, Netherlands
[3]Georg-August University Gottingen, Department of Clinical Neurophysiology, Germany
[4]University of Amsterdam, Amsterdam Brain & Cognition ABC, Netherlands

Social categorization and group identification are essential ingredients for maintaining a positive self-image that often lead to negative, implicit stereotypes toward members of an out-group. The medial Prefrontal Cortex (mPFC) may be a critical component in counteracting stereotypes activation. Here, we assessed the causal role of the mPFC in these processes by non-invasive brain stimulation via transcranial direct current stimulation (tDCS). Participants (n=60) were randomly and equally assigned to receive anodal, cathodal, or sham stimulation over the mPFC while performing an Implicit Association Test (IAT): They were instructed to categorize in-group and out-group names and positive and negative attributes. Anodal excitability-enhancing stimulation decreased implicit biased attitudes toward out-group members compared to excitability-diminishing cathodal and sham stimulation. These results provide evidence for a critical role of the mPFC in counteracting stereotypes activation. Furthermore, our results are consistent with previous findings showing that increasing cognitive control may overcome negative bias toward members of social out-groups.

Symposium Abstracts

The medial frontal cortex mediates self-other discrimination in the Joint Simon task: a tDCS study

R. Liepelt[1], B. Klempova[1], T. Dolk[2], L.S. Colzato[3], P. Ragert[4], M. Nitsche[5], B. Hommel[2]

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[2]Max-Planck-Institute for Human Cognitive and Brain Sciences, Psychology, Germany
[3]Leiden University, Psychology, Netherlands
[4]Max Planck Institute for Human Cognitive and Brain Sciences, Neurology, Germany
[5]University Medical Center Goettingen, Clinical Neurophysiology, Germany

Interacting with other individuals confronts cognitive control systems with the problem of how to distinguish between self-generated (internally triggered) and other-generated (externally triggered) action events. Recent neuroscience studies identified two core brain regions, the anterior medial frontal cortex (aMFC) and the right temporo-parietal junction (rTPJ), to be potentially involved in resolving this problem. Using transcranial direct current stimulation (tDCS), we investigated the role of the aMFC and the TPJ for the online control of selfgenerated vs. other-generated event representations in a joint Simon task. In two experimental sessions, participants received anodal, cathodal, or sham tDCS, while performing an auditory joint Simon task. In addition to a general performance enhancement during cathodal (inhibitory) and anodal (excitatory) stimulation with increased practice, we found a significantly increased joint Simon effect (JSE) during cathodal stimulation of the aMFC (Experiment 1), as compared to sham stimulation. No modulation of the JSE was found during stimulation of the rTPJ (Experiment 2). The aMFC seems to be crucially involved in resolving the self-other discrimination problem in the joint Simon task.

Symposium Abstracts

Modulatory effects of transcranial direct stimulation on utilitarian responses to moral dilemmas

P. Riva[1], A. Manfrinati[1], S. Sacchi[1], L.J. Romero Lauro[1]

[1]University of Milano-Bicocca, Psychology, Italy

A vast body of research showed that the ventromedial prefrontal cortex (VMPFC) is involved in moral decisionmaking. In particular, previous studies found that neuromodulatory techniques, such as transcranical direct current stimulation (tDCS), applied over the VMPFC can modulate responses to moral dilemmas. However, it is still unknown how tDCS over the VMPFC can affect different types of moral dilemmas differently. In the present study, we investigated how tDCS over the VMPFC affects different types of moral dilemmas, such as incidental and instrumental moral dilemmas, with or without personal involvement. Furthermore, we assessed whether tDCS effect on moral dilemmas would be modulated by individual differences in individuals' deontological stance. Participants were 100 healthy subjects (50 males) who completed a questionnaire to assess their level of deontology. Then, they were randomly assigned to receive anodal, sham, or cathodal tDCS stimulation over the VMPFC. Finally, participants completed a series of 40 moral dilemmas, which included both incidental and instrumental dilemmas, with and without personal involvement. Results showed that participants receiving cathodal stimulation over the VMPFC provided lower levels of utilitarian responses than those receiving anodal tDCS. However, this effect was specific to incidental dilemmas, considering that for instrumental dilemmas, no differences emerged among the anodal, cathodal, and sham stimulation. Moreover, no interaction between tDCS stimulation and the degree of personal involvement in moral dilemmas was found. Finally, we found a moderating role of individual differences in participants' deontological stance, with individuals high in deontology being more affected by the tDCS manipulation. Specifically, cathodal tDCS reduced utilitarian responses to incidental dilemmas to a higher degree for those high in deontology than for those low in deontology. Overall, our findings provide insights on how neuromodulation of VMPFC can affect different types of moral dilemmas differently.

Symposium Abstracts

10:00 – 10:20

The involvement of medial prefrontal cortex in fairness evaluation: Evidence from fMRI and tDCS studies

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[1]Radboud University, Donders Institute for Brain Cognition and Behaviour, Netherlands
[2]University of Brescia, Neuroscience Section, Department of Clinical and Experimental Sciences, Italy
[3]IRCCS Centro San Giovanni di Dio Fatebenefratelli, Brescia, Cognitive Neuroscience Section, Italy
[4]SISSA, Neuroscience Area, Italy

A large amount of literature has established that people, on average, are more willing to reject a sure amount of money rather than accept an unfair offer made by another individual. However, it is not clear whether rejections are driven by pure fairness considerations or they are caused by an impulsive reaction to being the target of an unfair treatment. We developed a modified version of the Ultimatum Game (UG) - a task to investigate unfairness perception - in which participants played both for themselves (myself –MS- condition), and on behalf of an unknown third-party (TP condition): in TP, as opposed to MS, participants responded to unfairness without being the target of it. Although no difference in the rate of rejections is found between MS and TP, neural correlates differ: a higher activation in the medial prefrontal cortex (MPFC) is observed when responders reject unfair offers in MS, but not in TP (Corradi-Dell'Acqua, Civai et al., 2013), suggesting that this activation is specific to the personal damage derived from the unfair offer. We aimed at further testing this finding by administering transcranial direct current stimulation (tDCS) to participants playing the same task. MPFC was localized using the coordinates in Corradi-Dell'Acqua et al. (2013); cathodal (N=20) and sham (N=20) stimulations were applied. We hypothesized that the inhibition of MPFC would decrease rejections in MS but not in TP. A significant Stimulation (cathodal, sham) * Target (MS, TP) interaction (β=0.141, p<0.001) indicates that, as predicted, the probability of rejection is lower for MS than for TP during cathode stimulation; moreover, in MS, the likelihood of rejection during cathodal stimulation decreases, compared to sham, for unfair but not for fair offers, thus confirming that MPFC is involved in processing unfairness only if unfairness damages the self.

Symposium Abstracts

A tDCS study on imitation inhibition and implicit theory of mind

L. Bardi1, E. Cracco1, M. Brass1

1University of Gent, Department of Experimental Psychology, Belgium

Although neuroimaging studies have consistently identified the temporoparietal junction (TPJ) as a key brain region involved in socio-cognitive processes such as imitation inhibition, perspective taking and theory of mind (ToM), previous transcranial Direct Current Stimulation (tDCS) studies failed to induce any modulation of performance in common tasks testing for explicit forms of ToM. A possible explanation is that most ToM tasks are not sensitive enough to detect performance modulation induced by stimulation in normal adults. In the present study we adopted a new implicit ToM task. Here subjects are required to respond when a ball appears from behind an occluder. An agent holding false of true belief concerning the position of the ball is present in the scene. Although the belief to the agent is irrelevant to the task, reaction times reveal that the other's beliefs affect our performance. Responses are faster whenever the agent thinks the ball is behind the occluder. Participants were tested in three sessions in which anodal, cathodal and sham tDCS was applied to the TPJ. Results revealed an effect of stimulation on imitation inhibition. Interesting cathodal stimulation improved participants' performance when the stimulation was delivered during the task. The same effect was obtained after anodal stimulation in the post-stimulation session. In line with previous observations, preliminary results revealed no reliable tDCS effects on the implicit ToM task. Results confirmed that tDCS may be an useful tool to improve socio-cognitive processes. However, data on the ToM task suggest the need of further investigations to clarify the role of TPJ in ToM and the possibility of stimulation interventions in this task.

Symposium

The role of stress in visual word recognition and reading aloud

A. Kyparissiadis[1], N. Pitchford[1], T. Ledgeway[1], W. van Heuven[1]

[1]University of Nottingham, School of Psychology, United Kingdom

Correct pronunciation of a printed word entails both phonological assembly of the constituent letter sounds and correct assignment of stress. In addition to reading aloud, stress has also been shown to operate in tasks of visual word recognition and silent reading, suggesting that assignment of stress might involve both orthographic and phonological processes. In languages with lexical stress (such as English, Italian and Greek), the reader needs to determine the dominant syllable that receives stress in order to produce the correct pronunciation. Whilst correct stress assignment is critical for reading multisyllabic words aloud, the mechanisms by which stress is derived during the reading process have yet to be determined, and there is a dearth of studies investigating stress assignment in visual word recognition and reading aloud compared to other aspects of reading. Yet the issue of stress assignment is critical to advancing universal models of reading. This is a complex matter, however, because different languages provide different sources of stress information (e.g., lexical, orthographic, statistical) and the weighting of these sources of information also differs across languages. Over recent years, a small body of studies has started to emerge that have investigated stress representation and assignment across different languages in monolingual and bilingual speakers. This symposium will bring together researchers who are conducting pioneering research in this area. Reporting on experimental research, they will address key issues, such as the lexical basis of stress, the interplay among different sources of information in determining stress position, interactions of stress assignment with other reading strategies, and effects of bilingualism on this aspect of reading.

Symposium

Symposium Abstracts

When orthography is not enough. The effect of lexical stress in lexical decision

L. Colombo[1], S. Sulpizio[2]

[1]Universita di Padova, Dipartimento di Psicologia Generale, Italy
[2]Universita di Trento, Department of Psychology and Cognitive Science, Italy

Three lexical decision experiments were carried out in Italian, with the aim to verify if stress dominance (the most frequent stress type) and consistency (the proportion and number of existent words sharing orthographic ending and stress pattern) had an effect on polysyllabic word recognition. Two factors were manipulated: whether the target word carried stress on the penultimate (dominant; graNIta, seNIle 'slush, senile') or on the antepenultimate (non-dominant) syllable (MISsile, BIbita 'missile, drink'), and whether the stress neighborhood was consistent (graNIta, MISsile) or inconsistent (seNIle, BIbita) with the word's stress pattern. In Experiment 1 words were mixed with nonwords sharing endings. In Experiment 2 the same stimuli were presented in lists blocked for stress pattern. In Experiment 3 we used a new set of nonwords, which included endings with (stress) ambiguous neighborhoods and/or with low number of neighbors, and which were overall less similar to words compared to Experiment 1 and 2. In all three experiments there was an advantage for words with penultimate (dominant) stress, and no main effect of stress neighborhood. However, the dominant stress advantage decreased in Experiments 2 and 3. Finally, in Experiment 4 the same materials used in Experiment 1 were also used in a reading aloud task, showing a significant consistency effect, but no dominant stress advantage. The influence of stress information in Italian word recognition is discussed.

Symposium Abstracts

Stress is not underspecified: Evidence from fragment priming in Greek

A. Andrikopoulou[1], A. Protopapas[1], A. Arvaniti[2]

[1]University of Athens, Department of Philosophy and History of Science, Greece
[2]University of Kent, Department of English Language and Linguistics, United Kingdom

Lexical stress is known to affect word recognition. Is it fully specified in the lexicon or is it underspecified and assigned upon words through metrical frames? Although previous findings seem to endorse an underspecified representation of stress, the evidence is not clear-cut. The current study addressed this issue using the fragment priming paradigm. The purpose was twofold: the replication of stress priming as it has been observed in Spanish, Dutch, and Italian; as well as the investigation of the nature of stress representation in accordance with theories of underspecification and metrical frames. To achieve this, 72 pairs of three-syllable words were selected and used as primes and targets. Word pairs shared all phonemes of their first two syllables and the first phoneme of their third syllable. Two-syllable fragments of the primes were presented auditorily in the end of neutral carrier sentences; targets appeared visually on a computer screen immediately thereafter. Stress pairs were grouped by stress contrast with primes and targets either matching or mismatching. In an additional neutral condition prime and target differed both segmentally and suprasegmentally. To test theories of stress representation, pairs were grouped by stress position, in three combinations of stress patterns. In particular, 24 pairs had stress on their first and third syllable, 24 had stress on their first and second syllable and 24 on their second and third syllable. If stress is underspecified, there should be no priming on penultimate-stress targets, because the default stress position is not specified in the lexicon; however, there should be priming with antepenultimate- and final-stress targets. 75 adult native speakers of Greek were tested. The results replicated stress priming effects, revealing both facilitation for matching pairs and inhibition for mismatching pairs. However, there were no priming differences among different combinations of stress patterns, raising doubts regarding stress underspecification.

Symposium Abstracts

Processing of stress diacritics on visual word recognition in skilled Greek readers

A. Kyparissiadis[1], N. Pitchford[1], T. Ledgeway[1], W. van Heuven[1]

[1]University of Nottingham, School of Psychology, United Kingdom

In Modern Greek, the position of lexical stress is consistently marked with orthographic diacritics on lowercase words. Hence, the reader can assign stress by utilizing sublexical information as well as relying on lexical resources. This study examined how stress position affects visual word recognition when diacritics are present and when they are not (uppercase words) in skilled Greek reading. Participants (n=32) performed a lexical decision task with disyllabic words and nonwords either stressed on the first (left) or the second (right) syllable (e.g. λέξη, τιμή). Words were either of high or low frequency and stimuli were presented in both upper and lower case. Analysis of results for uppercase stimuli showed no difference in response times however accuracy was higher for low frequency words stressed on the left compared to the right. This replicates the pattern reported previously in Italian which is also a transparent orthography but does not use diacritics to mark stress position. In contrast, for lowercase stimuli, analysis of reaction times showed high-frequency words were recognised faster when diacritics were positioned on the right, but nonwords were responded faster when diacritics were on the left. This interaction was not influenced by syllabic frequencies and seems to reflect a shift from sublexical to lexical strategies as a final letter advantage has been suggested to reflect lexical processing. Effects of stress neighbourhood, which might have a prominent role in the stress assignment mechanism, are currently being investigated. This unique pattern of results suggests that stress diacritics act as orthographic units that should be incorporated into models of Greek reading. Preliminary simulation results of a Greek version of the Interactive Activation Model will be presented to show how the model can account for the behavioural data found with the lexical decision task.

Symposium Abstracts

The role of stress position in bilingual word recognition: Cognate processingin Turkish and Dutch

A. Muntendam[1, 2], R. van Rijswijk[3], T. Dijkstra[4]

[1]Florida State University, Modern Languages and Linguistics, United States
[2]Radboud University Nijmegen, Centre for Language Studies, Netherlands
[3]Radboud University Nijmegen, Centre for Language Studies & Department of Linguistics, Netherlands
[4]Radboud University Nijmegen, Donders Institute for Brain, Cognition and Behaviour, Netherlands

This study examines the effect of stress position on cognate processing by Turkish-Dutch bilinguals (heritage speakers of Turkish) in the Netherlands. Research in the visual modality indicates that, when reading a cognate, overlapping orthographic, phonological and semantic representations of the two languages are activated, often leading to faster responses to cognates than non-cognates (facilitation effect). However, little research is available on cognate processing in the auditory modality. This is one issue considered in the present study for Turkish and Dutch. Furthermore, these languages differ regarding stress position. In Turkish, most words bear ultimate stress, whereas Dutch has a tendency for stress on the first syllable. In Turkish-Dutch cognates, stress position can be congruent across languages (ultimate-ultimate (ULT-ULT) or penultimate-penultimate (PEN-PEN)), or incongruent (Turkish ultimate-Dutch penultimate (ULT-PEN)). Auditory lexical decision tasks were developed in Turkish and Dutch to answer two questions: (1) Is there a cognate effect in auditory word-recognition in Turkish and Dutch?; (2) What is the effect of stress position on bilingual processing? Twenty-one Turkish-Dutch bilinguals participated in the Turkish task, and twenty in the Dutch task. Twosyllable items occurred in three conditions: ULT-ULT, PEN-PEN, and ULT-PEN. Reaction times and accuracy rates were measured. The results revealed faster processing in Dutch than Turkish, indicating an effect of language dominance. For Turkish, cognate inhibition effects were found in all conditions, especially in PEN-PEN. For Dutch, facilitation was found for ULT-ULT and ULT-PEN, but not for PEN-PEN. The results for PEN-PEN suggest that the coactivation of words with atypical stress position in Turkish delayed processing. These findings suggest that the auditory presentation of cognates activates representations in both languages, but that the effect (facilitation/inhibition) depends on language dominance and stress position. In all, this study provides more insight into word representations in bilinguals. The findings will be extended with EEG data.

Symposium Abstracts

10:20 – 10:40

On-line use of subphonemic cues for lexical stress in L1 and L2 word Recognition

A. Post da Silveira[1], T. Dijkstra[2]

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[2]Radboud University, Donders Institute for Brain, Cognition and Behaviour / Donders Centre for Cognition, Netherlands

The use of lexical stress in auditory word recognition is often assumed to occur later than segmental information. However, spectral information appears to be an attribute of stress but is used early in recognition. American English and Brazilian Portuguese (BP) follow different patterns for the relationship between spectral reduction and word stress. In English, pre-tonic vowels are reduced, while in BP the reductions occur only regarding vowel duration, but not spectra. BP learners of English tend to categorize the reduced vowels of English to their full forms both in production and in perception, so that the first syllable of the word pair advertise-advantage would sound the same. We developed a visual world paradigm eye-tracking experiment that tested at which moment in time English L1 and L2 listeners make use of the spectral reduction cue for word stress identification. In the experiment, 360 trisyllable words were visually presented, divided into 4 categories built by the manipulation of two variables: 1) segmental overlap and ii) word stress overlap, both on the first syllable of English words. Listeners had to identify which of the 4 words on screen was auditorily presented to them. For all listeners, fixations on the target word (such as "ADjective") were more frequent than fixations on segmentally overlapping but word stress incongruent competitors (such as "adVANtage") before subsequent segmental information was available to disambiguate the auditory input. Brazilian listeners of English, on the other hand, gave the same number of looks to target and competitor, indicating that vowel reduction was not used as a cue for unstressed syllables. It is concluded that English L1 listeners recognize words by immediately applying all relevant acoustic cues from the speech signal, while English L2 listeners categorize durational and spectral aspects of L2 according to their L1 phonetic representation of word stress.

Oral Presentation

The emergence of space: Vision selects objects, not locations

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Vision is typically argued to select information based on both space- and object-oriented representations. We argue that a selection mechanism that distributes processing in a graded manner across space (even one modulated by perceptual objects) is non-optimum, given the scale-invariant structure of spatial information in visual scenes. We argue that evidence previously taken to indicate space-oriented selection instead reflects a probabilistically object-oriented process, since while spatial separation is one cue to the probability that any two points in a scene belong to the same object, the function relating spatial separation to probability of 'object belongingness' is scale invariant. Furthermore, because spatial separation is only one such cue, a system that distributes selection in a spatially graded way will not optimally recover adaptively relevant information, namely, the objective structure of the environment. We developed stimuli to test this idea: two concentric equilateral triangles, one rotated 180 degrees relative to the other, and one superimposed on the other. Thus, the stimuli incorporated a non-monotonic relationship between spatial separation and object-belongingness, and contained strong cues other than spatial separation (e.g., colour, occlusion) to the object-belongingness of different points in the scene. Participants were required to discriminate luminance changes in object features following a cue at the same or a different feature. While targets occurring at a cued feature were processed more readily than any others, there was no evidence of a spatial gradient in performance with increasing cued and target feature separation. The only effect of cue-target separation occurred when cued and target features belonged to different objects. Furthermore, this spatially invariant object advantage was equivalent across a range of spatial scales. We propose that the primary selection mechanism in vision is object-oriented, and the perception of space emerges from the structure of objects and the relations between them.

Oral Presentation

11:20 – 11:40 | Lara A - B

Adaptation to Change in Memory-Guided Visual Search: Contextual Learning of Object Identity and Spatial Configuration

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In order to deal with our complex visual environment, human observers have developed the capability to extract a variety of statistical regularities in our ambient array, thereby facilitating attentional orienting. For instance, in visual search, detection of a target is faster when the spatial configuration or the object identities of nontarget items are repeatedly encountered. These results show that both spatial and object-based contextual invariances can implicitly guide attention to the target (contextual cueing; Chun, 2000, Trends Cogn. Sci., for review). Here, we explored how such acquired contextual regularities can be adapted subsequent to an unexpected environmental change (see also Zellin et al., 2014, Psychonomic Bull. Rev.). A series of experiments were performed in which, in an initial learning phase, observers learned to associate a given repeated context of nontargets with a given target. A subsequent test phase then introduced identity and/or location changes to the target. Our results show that observers were rather ineffective in adapting to a change of the spatial location, or to the object identity of the target. However, when the change to the target occured both in terms of its identity and in location, then contextual cueing was effective again shortly after the change – showing that successful adaptation occurred. These results suggest that contextual learning is capable to efficiently extract regularities relating to the spatial configuration and to object identity at first. However, contextual learning, once acquired, is rather insensitive to adapt, at least, as long as it does not reveal a „rich", i.e., redundant change signal that combines both spatial- and object-based scene statistics.

Oral Presentation

Forget me if you can: Attentional capture by to-be-remembered and to-be-forgotten visual stimuli

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Visual attention is biased towards items that match the content of working memory. Here, we investigated whether attention is still guided towards matching items after an instruction to forget them. Participants memorized a colored shape, which was followed by a cue that indicated whether it should be remembered or forgotten. Subsequently, participants searched for a tilted line among vertical distractor lines, each embedded within a colored shape. The interval between the cue and the visual search task (ISI) ranged from 200 to 3400 ms and on some trials, one of the distractors in the search task matched the earlier-memorized object. The results showed that the matching distractor captured attention regardless of whether it had to be remembered or forgotten and regardless of ISI, but the capture effect by to-be-forgotten distractors was smaller. In two subsequent experiments, the cue following the earlier-memorized object indicated whether its shape or color had to be remembered, and the cue could be presented after or before the memory object. The results showed evidence of capture by distractors that matched the to-be-remembered and the to-be-forgotten color and no evidence of capture by distractors that matched the to-be-remembered or to-be-forgotten shape. We conclude that an instruction to forget an object leads to a reduced likelihood of capture compared to instruction to remember, but it does not fully prevent capture. In addition, the results suggest that an instruction to remember only one feature of an object, and to forget the other feature, did not affect attentional capture.

Oral Presentation

Face processing under cognitive load

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Faces provide a wealth of socially pertinent information about the owner, such as gender, age, emotional state and personality. In recent years research has focused on factors that influence our ability to make such judgments affectively. Whether this germane process occurs automatically or requires controlled attention remains unconsolidated (e.g. Batty & Taylor, 2003; Dillen et al., 2009). In this talk, findings from three Experiments aimed to clarify the automaticity of face processing will be presented. Firstly we report how facial categorisation according to age and gender is affected by cognitive load. Secondly the influence of cognitive load on emotional categorisation will be reported. Finally a cross cultural comparison (British Vs Japanese) of cognitive load's impact on emotion recognition will be discussed. Collectively the finding inform us which aspects of face processing are sensitive to cognitive load and thus not fully automated, as well as highlighting if these effects are culture specific.

Oral Presentation

11:20 - 11:40 | Amoroza A

Dorsal Stream Contribution to the Configural Processing of Faces

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Human face recognition and face individuation is often attributed to configural processing, that is, processing of the spatial relationships among the shape features of a face, such as the distance between the eyes, nose and mouth. The configural processing of faces is thought to be subserved by brain regions within the ventral visual pathway, more specifically, brain regions involved in face perception such as the fusiform face area. Configural processing, however, likely involves visuospatial mechanisms, which raises the question of whether brain regions within the dorsal visual pathway, the main location processing network of the brain, contribute to this process and, if so, whether the dorsal stream is necessary for the configural processing of faces. Here, we explored this issue in human adults performing a same-different face task while undergoing functional magnetic resonance imaging and, in a separate experiment, while undergoing transcranial magnetic stimulation (TMS). Two face exemplars presented simultaneously on a screen could differ in terms of the shape (featural differences) or the spatial configuration of their shape features (configural differences). Differences (featural/configural) were matched in difficulty (RT and accuracy), number and pattern of eyefixations. Within a-priori localized, dorsal stream regions (identified using an independent, distance-estimation localizer), configural differences led to significantly stronger activation compared to featural differences and the magnitude of this activation correlated with behavioral performance. Further, bilateral transcranial magnetic stimulation centered at the most active voxel of the distance-estimation localizer task (identified separately for each participant within dorsal cortex) significantly impaired participants performance on configural but not featural difference detections between faces, in comparison to no TMS trials and TMS on the vertex (the control site). We conclude that location-processing mechanisms within the dorsal visual pathway process the configuration of face features and, further, appear to be necessary for the configural processing of faces.

Oral Presentation

11:40 - 12:00 | Amoroza A

The Role of Perceptual Load in Processing Distractor fearful faces in Social Anxiety

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Social Anxiety (SA) has been associated with attention biases for social cues, such as face expressions. A considerable amount of research suggests that SA individuals are hypervigilant to threatening facial stimuli such as angry expressions. However, other studies support that SA individuals show attentional bias to other types of faces (e.g. neutral, disgust, fearful and happy expressions). Here we examined whether interference by distractor fearful or neutral faces is affected by Perceptual Load (PL) in high SA individuals, similar to low SA individuals.

Thirty students of University of Cyprus, were grouped into low (N=16) or high (N=14) SA groups based on their SPAI-23 SA score. Participants performed a visual letter-search task of low (low PL) or high (high PL) Perceptual Load. Participants searched for an X or N target letter among small Os (low PL) or among other similar angular letters (high PL).The letters were arranged in a circle around fixation. An irrelevant, to the task, image of a face (fearful or neutral) was presented in pseudorandom order on 20% of the trials at the center of screen.

A repeated measures ANOVA with SA (high, low), Load (low PL, high PL), Presence (present, absent) and Face type (fearful, neutral) showed a main effect of Load (participants were slower in high PL compared to low PL condition). Additionally, a three-way interaction was found between SA, Presence and Face type, with high SA participants having slower reaction times to the face-present trials for both fearful and neutral stimuli than in the face absent trials. Low SA participants were also slower in the fearful present trials compared to face absent trials. Results may suggest specific processing of neutral face stimuli in high SA individuals.

Oral Presentation

11:00 - 11:20 | Amoroza B - C

Going through the emotions on the space-time continuum

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Humans experience mental time travel by reliving past experiences and visualising potential future events. These visualisations are represented linearly, on a mental timeline, with past events on the left and future events on the right. Valence also influences how an event is remembered/imagined. Interestingly, valence is lateralised, such that negative information is associated with the left, whereas positive information is associated with the right. We investigated whether valence effects occur when only one side of the mental timeline is represented. In Experiment 1, participants generated positive and negative events, associated with a keyword, occurring in either the past or future. They indicated, using a horizontal slider, when each event occurred, ranging from present to birth/death. Consistent with previous research, negative events were placed further from present and most events occurred in the near past/future. In Experiment 2, the timeline was reduced to the past/next 5 years. Negative events were placed to the left of positive events for both past and future. This result contrasts prior research wherein future negative events are temporally distant (to the right of positive events), to maintain psychological distance. The horizontal slider enabled events to be individually placed, allowing the underlying left-negative association to emerge.

Oral Presentation

11:20 - 11:40 | Amoroza B - C

Embodiment, transcendence and empathy: effects of Yoga and Mindfulness practice on emotion recognition

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Mental representation of ourselves and of others is strongly linked to mapping our bodily states. Mounting evidence suggests that even higher order socio-cognitive representations such as mind and intention reading and emotion recognition can be mapped onto modal sensorimotor cortices. Such bodily instantiation of cognitive operations, which is referred to as embodiment and is searched for in practices like Yoga, allows the apprehension of others' mental, perceptuo-motor and emotional states through simulative representations of external events into internal, bodily states. At the same time, the ability to assume an external perspective on actual body perceptions and actions (self-transcendence) is inherently linked to human beings and is searched for in several practices as Mindfulness. Here we compared the effects of Yoga and Mindfulness practice on the ability to recognize emotions in others' faces and bodies. A group of 20 participants followed, while lying down, two short, 5-min induction instructions asking to notice bodily sensations with a decentering perspective (adapted from mindful movement scan) or to actively perform with an embodied perspective a series of Yoga movements (adapted from the Supta Tadasana Yoga practice). Before and after the instructions they were asked to either recognize the emotional valence (i.e., positive vs. negative) or the gender of a series of faces and bodies presented on a computer screen. They responded by means of speeded manual key presses. Results showed that the Yoga practice, which is supposed to enhance embodiment, heightened recognition of face but not body emotional expression as compared to both baseline and Mindfulness practice, supposed to enhance self-transcendence. No effects were obtained for the gender recognition task. This finding shows that even a short embodiment induction may boost emotion recognition abilities, providing experimental support to the view that social perception relies, at least partially, on embodied representations.

Oral Presentation

11:40 - 12:00 | Amoroza B - C

Impact of anger and happiness on the attentional networks

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Anger and happiness are two highly aroused emotions with opposite valences. Most of the studies investigating about their influence on attention have used emotionally connoted stimuli. The aim of this research was to study the influence of anger and happiness on the attentional processing of neutral stimuli, using the Attention Network Test–Interactions (ANT-I). This test, based on the model developed by Posner, suggests that the attention is subdivided into three independent but interconnected networks: alerting, orienting, and executive control. Previous research has revealed that a high level of arousal can increase the sensitivity to the environment and a preparation to the processing of new stimuli. Thus, our hypothesis was an increase in the alerting network efficiency for both emotions. In this experiment, we induced our participants into three moods: anger, happiness, or control. The response times were converted into attentional scores, indicating the efficiency of each attentional network. As expected, the results showed a better alerting score for the angry and the happy groups, indicating that they took a greater advantage of an alerting cue. One possible origin of this increased alerting network efficiency is related to the physiological dimension of arousal. However, the happy induction also provoked an unexpected improvement of the orienting network, suggesting that they took a greater advantage of a valid spatial cue. Therefore, it seems that another factor, in addition to the valence and the arousal, can also modulate the efficiency of the attentional networks. The results obtained should enlighten the interaction between emotion and the functioning of the attentional system. They also may be relevant for applied fields related to emotions and attention.

Oral Presentation

11:00 - 11:20 | Amoroza D

Role of attention in enhancement of emotional memory: short- and longdelay retrieval

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Enhancement of emotional memory (EEM), better memory for emotional stimuli than neutral stimuli was frequently reported in the literature. One of the factors thought to be involved in EEM is attention. It is not clear whether the role of attention differs according to the delay between encoding and retrieval, and the emotional valence of the stimuli. There are few studies that directly compared the role of attention in EEM after short and long delay (Talmi et al., 2007; Sharot & Phelps, 2004), and according to stimuli valence (Talmi et al., 2007; Kern et al., 2005). We examined EEM after short- and long- delay between encoding and retrieval for moderately arousing negative and positive stimuli by manipulating the quantity of attentional resources available (full-attention versus divided-attention) during encoding. We explored the role of attention in EEM after two different delays between encoding and retrieval to check whether attention, thought to be one of the factors mediating EEM after a short delay, also plays an important role after a long delay. We used a divided-attention paradigm to manipulate the availability of attentional resources. Seventy-six students performed full-attention (FA) and divided-attention (DA) encoding of emotional (negative and positive) and neutral pictures followed by recognition after either a short (2 minutes) or long (24 hours) delay. Participants' ability to distinguish between new and old pictures was better for emotional than neutral pictures. Most importantly, it tended to differ as a function of the delay and encoding condition between negative and positive pictures. In short delay retrieval participants recognized emotional stimuli better than neutral ones, independently of the encoding condition. In long delay retrieval positive pictures were recognized better after FA encoding and negative picture after DA encoding. These results suggest attention may contribute differently to EEM depending on the delay between encoding and retrieval.

Oral Presentation

11:20 - 11:40 | Amoroza D

A short nap promotes implicit and explicit memory performance in tactile search

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Recently Assumpcao et al. showed that the tactile context facilitates tactile search. Using a variant of visual contextual cueing, (CCt), solenoid actuators were attached to the four fingers of observers' hands (except the thumbs). Their task was to detect and discriminate the singleton tactile target (defined with a different intensity relative to the distractors). Unbeknown to observers was that half of the trials contained repeated tactile arrangements. Reaction times were faster for repeated compared to new displays, a process deemed implicit given that participants were unable to tease apart repeated form new configurations. Given the incessant debate concerning the role of sleep in the consolidation of different types of (procedural) memory, in the current study we investigated sleep effects on tactile contextual cueing. The "all-round" characteristic of the paradigm suffices as an ideal approach for understanding sleep effects on implicit contextual learning and explicit memory of repeated configurations. Participants performed both a search- and recognition task in two experimental sessions (morning: learning; afternoon: test), divided by either a short nap or rest. It was found that while in the nap group implicit tactile cueing was relatively constant across sessions, cross-session cueing performance was drastically reduced in the control group. Furthermore, observers' ability in discriminating repeated form new configuration increased from session 1 to session 2 in the nap, but not rest, group. These are the first effects showing that a short nap boosts implicit and explicit memory performance in a tactile spatial learning task.

Oral Presentation

11:40 - 12:00 | Amoroza D

Feature position and head saliency but not labels facilitate categorisation in adults

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In forming categories people rely both on the visual appearance of objects (Murphy, 2004; Robinson & Sloutsky, 2007; Sloutsky & Fisher, 2001) and on category labels (Althaus & Westermann, under review; Balaban & Waxman 1997; Lupyan et al., 2007; Plunkett et al., 2008; Younger, 1985; Waxman & Booth 2003; Waxman & Markow 1995). Do labels have a privileged status over perceptual cues in facilitating category learning in adults? The present study aimed at answering this question in a simple categorization task. Two groups of participants were trained to categorize drawings of novel cartoon animals with four binary-valued features into two categories; in one group category members were labeled. Furthermore, both labeling and nolabeling groups were divided into four sub-groups according to feature saliency. Finally, the position of the feaures was also taken into account with left and top positions being expected to attract more attention. The error patterns have shown that head-saliency and feature-position saliency (top and left) led to more successful categorisation process. There were no significant differences regarding RTs. On the other hand, and contrary to previous research in adults (Deng & Sloutsky, 2012), labels did not advance category formation. The groups which relied on foot for object classification made the most errors in the categorisation process and significantly more in comparison to the other three groups which rely on head, tail or wing, respectively. Furthermore, left and top position of features led to smaller number of errors in categorisation in comparison to head-salient condition. In conclusion, we found that object feature saliency as well as feature position led to better categorisation performance, whereas labels did not play significant role in novel-object categorisation.