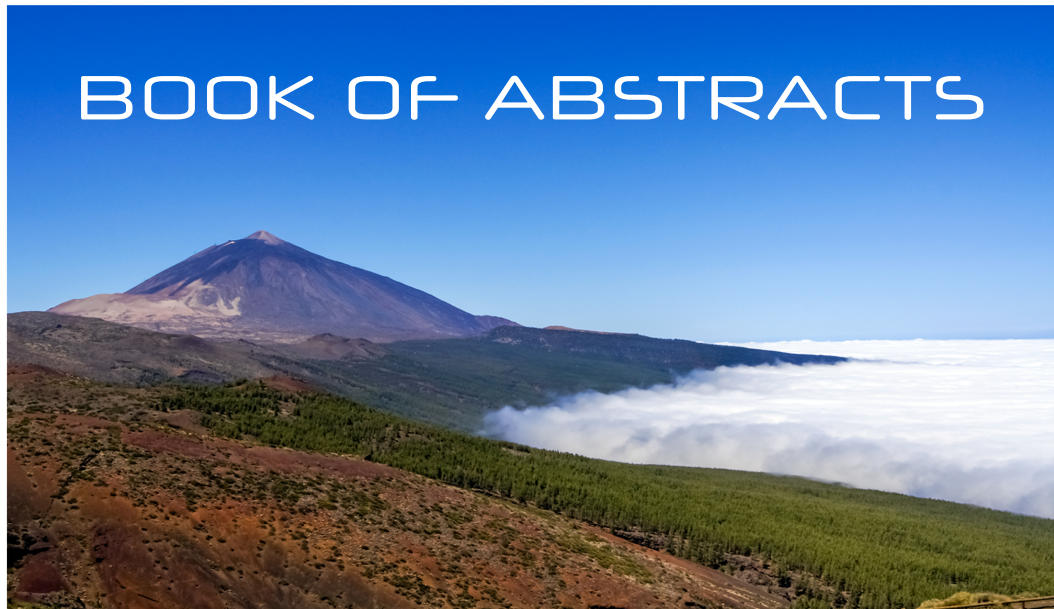


21ST Conference of the
European Society for Cognitive Psychology



25-28 September, 2019

Tenerife, Spain



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COMMITTEES

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GENERAL TIMETABLE

WEDNESDAY 25th

13:30-14:30	Satellite Event 1	European Research Council- funding opportunities. Pilar Lacruz
14:30-16:10	Satellite Event 2	OpenSesame Workshop. Sebastiaan Mathôt
16:10-17:50	Satellite Event 3	Women in Cognitive Science. Teresa Bajo & Lorenza Colzato
17:50-19:30	Satellite Event 4	Wolfgang Köhler in Tenerife (1913-1920): A tribute to a pioneer in cognitive psychology. Michel Denis & Carlos J. Álvarez
19:30-20:30	Opening reception - Welcome Cocktail	Mediterranean Palace Hotel

THURSDAY 26th

9:00-10:00	KEYNOTE 1	Kia Nobre: REMEMBERING WITH THE BENEFIT OF FORESIGHT								
10:00-10:30	COFFEE	Espejos Hall								
10:00-11:30	POSTER SESSION 1									
11:30-13:10	SYMPOSIUM SESSION 1	Temporal Attention	EWOMS Symposium. Working Memory: Too Many Theories?	Does Core Cognition Structure Human Language?	Time for Embodiment. New Evidence for the Time Course of Bodily Reference in Cognition	Acting in a Complex World. Emerging Perspectives on Human Agency	Integrated and Flexible Spatial Representations: Who Makes Them (When and How), and Why They Are Important	Auditory Cortical Entrainment in Relation with Language Processing	Development and Plasticity of Executive Functions	
13:10-14:40	LUNCH	Cleopatra Hotel								
14:40-17:20	ORAL SESSION 1	Neuroscience of Language	Perception	Language Processing I	Emotion	Multitasking	Action	Attention	Spatial Processing	Problem Solving
17:20-17:40	COFFEE	Coffee Break sponsored by Springer								
17:40-20:00	ORAL SESSION 2	Working Memory	Cognitive Control	Neural Plasticity	Bilingualism	Language Development	Sociality	Arithmetics I	Time Processing	

FRIDAY 27th

9:00-10:00	KEYNOTE 2	Gabiella Vigliocco: ECOLOGICAL LANGUAGE: A MULTIMODAL APPROACH TO THE STUDY OF LANGUAGE LEARNING AND PROCESSING								
10:00-10:30	COFFEE	Espejos Hall								
10:00-11:30	POSTER SESSION 2									
11:30-13:10	SYMPOSIUM SESSION 2	Multimodality in Language Learning and Processing	10 Years European Summer School on Computational Modelling of Cognition	From Monkey to Man — 100 Years of Problem Solving Research Since Wolfgang Köhler	Peripersonal Space Representation in Individual and Social Contexts	The Psychology of Human Habits	The Multifaceted Manifestations of Autobiographical Memory: From Severely Deficient to Highly Superior Performance, Passing Through Normal Functioning	On the Interplay Between Orthographic and Motor Processes During Word Writing	Emotional Conflict - Cognitive Conflict	
13:10-14:40	LUNCH	Cleopatra Hotel								

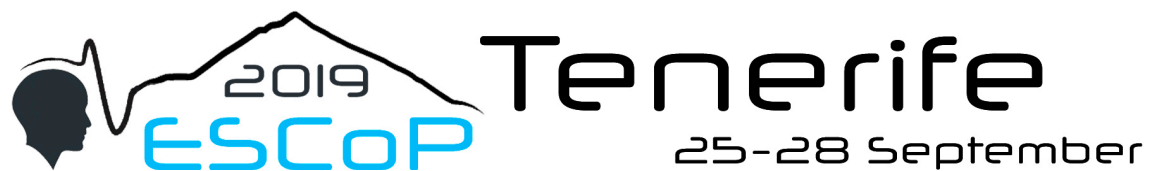
14:40-15:40	KEYNOTE 3	Senne Braem: WHAT CONTROLS COGNITIVE CONTROL?							
15:40-17:20	SYMPOSIUM SESSION 3	Recent Advances in Cognitive Control Research	Language Learning as a Byproduct of Communication	Numerosity Perception	Beyond this Reality: VR as a Paradigm for Interactive and Embodied Social Cognition	Spontaneity in Future Thinking: A Forward-Looking Research Symposium	Is Memory Slave to the Rhythm? Focus on the Role of Timing and Temporal Factors in Verbal Short-Term Memory	Negation Processing: New Insights and Models	New Findings and Approaches on Strategic Variations in Human Cognition
17:20-17:50	<i>COFFEE</i>	Espejos Hall							
17:20-18:50	POSTER SESSION 3								
19:00-20:00	<i>ESCOP BUSINESS MEETING</i>	Cibeles Room							
20:30-22:30	<i>CONFERENCE DINNER *</i>	Cleopatra Hotel							

SATURDAY 28th

9:00-10:00	KEYNOTE 4	Manuel Carreiras: TWO LANGUAGES IN ONE BRAIN							
10:00-11:40	SYMPOSIUM SESSION 4	Bilingualism, Development and the Brain: A Neuroemergentist Perspective	Motivation for Effort: Physiology, Behaviour and Neural Computations of How Humans Face Cognitive and Physical Challenges	The Role of Reasoning in Moral Decision Making	Exploring Cognition Using New Technological Advances Such as Embodied Artificial Agents	Current Topics in Music Cognition: Perceiving Time and Structure	Don't Forget to Take Your Medication when Cooking Dinner: How Are Working Memory and Prospective Memory Related?	Experimental Approaches to Reading Acquisition	The Origins and Consequences of Monitoring Processes in Human Action Control
11:40-13:10	POSTER SESSION 4	Espejos Hall							
12:00-13:00	<i>BRUNCH</i>								
13:10-14:30	ORAL SESSION 3	Robots	Face Processing	Language Processing II	Emotion and Attention	Memory	Visual Attention	Dyslexia	Arithmetics II
14:30-16:10	SYMPOSIUM SESSION 5	Theories and Models of Human Intelligence: Recent Developments	Probing the Mind with Magic	Communication Systems Across Species: How Research on Animals Inspires Research on Humans	Where Next? The Future of Embodiment Research	Public Acceptance and Rejection of Science in a 'Post-Truth' World	Spatial Learning and Navigation from the Individual Differences Perspective	Auditory Comprehension under Adverse Listening Conditions	Exploring Decision-Making through Computational Modeling
16:10-17:00	<i>CLOSING CEREMONY</i>	Auditorio							
17:00-20:00	<i>Visit to the Teide National Park **</i>								

* Only included in Full Fees

** Not included in the Basic and Full Registration Fees



SATELITE EVENTS

To be held on Wednesday 25th
from 13:30 to 19:30 in the *Auditorio* hall

13:30-14:30. European Research Council- funding opportunities.

Organizer: Pilar Lacruz. *European Research Council Executive Agency (Belgium)*

As Scientific Officer in charge of panel "The Human Mind and its Complexity", Pilar Lacruz will present the ERC, the different granting schemes (size of grants, eligibility criteria, applicants' profiles) in the frame of the on-going and next ERC Work Programme.

The European Research Council (ERC) aims to stimulate scientific excellence in Europe by supporting the very best scientists, scholars and engineers in any field of research. ERC grants are awarded through peer reviewed open competition to projects headed by starting and established researchers, irrespective of their origins. The sole criterion for selection is scientific excellence. There are neither thematic priorities, nor geographical quotas. The competitions are open to top researchers from anywhere in the world, provided that they are based in or are moving to Europe (although one of the Principal Investigators in a Synergy grant Group may be based outside of the EU or an Associated Country).

ERC awards flexible, long-term funding for a period of up to five years. The four main ERC frontier research grants are: **Starting**; **Consolidator**; **Advanced**; and **Synergy Grants**. ERC Principal Investigators may also be able to apply for Proof of Concept Grants.

ERC Starting Grants are designed to support excellent Principal Investigators that are starting their own independent research team or programme. **ERC Consolidator Grants** support excellent Principal Investigators that may still be consolidating their own independent research team or programme. **ERC Advanced Grants** are designed to support excellent Principal Investigators at the career stage at which they are already established research leaders with a recognised track record of research achievements. **ERC Synergy Grants** support small groups of two to four Principal Investigators and their teams with a designated Corresponding Principal Investigator. The constitution of the research teams is flexible. The nature of the collaboration within an ERC Synergy Group is expected to be fundamentally different from that of a network or consortium of undertakings, universities, research centres or other legal entities.

This session aims to give an overview of ERC activities.

14:30-16:10: OpenSesame Workshop

Organizer: Sebastiaan Mathôt. *University of Groningen, Netherlands*

This OpenSesame workshop will take place as a pre-conference event before ESCoP 2019. Participation is free and no registration is required.

The workshop consists of two main parts. In the first part, corresponding to the Basic Steps below, we created a complete experiment together. In the second part, corresponding to the Extra Assignments below, you will finish and improve the experiment by yourself.

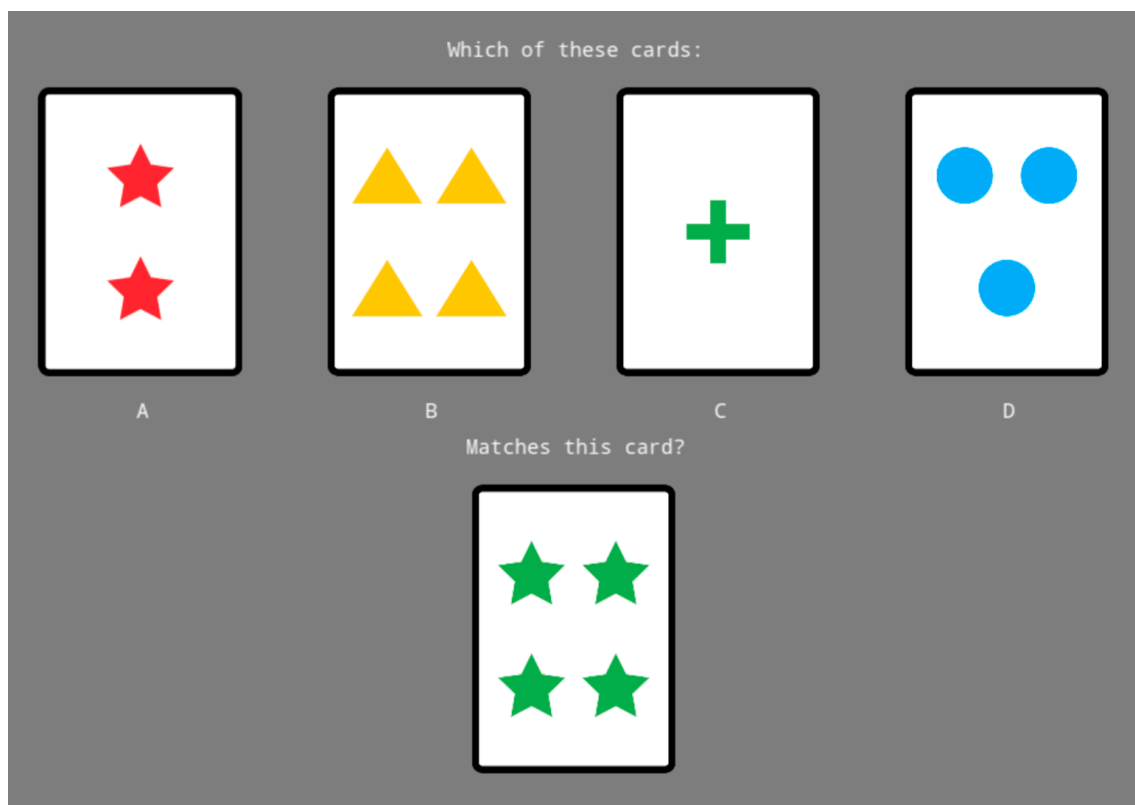


Figure 1. The Wisconsin Card Sorting Test (WCST) is a neuropsychological test of executive functions.

You will implement the Wisconsin Card Sorting Test (WCST) and learn how you can run this test online with OSWeb.

In the WCST, participants see four stimulus cards, which differ on three dimensions: color (red, green, blue, yellow), shape (circle, star, triangle, cross), and number of shapes (one, two, three, or four). Participants also see a single response card, which also has a color, shape, and number.

The participant's task is to match the response card to the correct stimulus card, based on a specific dimension (e.g. color), or matching rule. The participant initially doesn't know on which dimension to match, and his or her task is to figure out the matching rule through trial and error.

To make things more difficult, the matching rule changes after every five correct responses. Therefore, the participant needs to flexibly update their matching rule.

16:10-17:50: Women in Cognitive Science

Organizers:

Teresa Bajo Molina. *University of Granada*

Lorenza Colzato. *University fo Leiden*

16:10-16:15: Introduction

16:15-17:00: Keynote lecture: Sexual harassment in academia: Confrontation and coping mechanisms.

Soledad de Lemus. *University of Granada*.

Abstract

Sexual harassment (SH) is defined as workplace harassment based on sex and gender. It is a form of discrimination with pervasive effects on well-being and which impairs work performance. In the first part of the talk, I will describe the existing forms of SH, the underlying psychosocial processes that sustain it, and discuss its implications for women and sexual minorities in academia. Then, I will describe organizational interventions as well as interpersonal and intergroup strategies that can be used to confront SH. I will discuss the implications of SH and sexism confrontation more broadly, considering the impact of confronter's gender, for social change. That is, I will focus on the role of women, but also men as allies against SH at the workplace.

17:00 - 17:10: Interactive Discussion

17:10 - 17:20: Brief Talk: Women's changing role in cognitive science in the last 30 years.

Cristina Cacciari. *University of Modena and Reggio Emilia, Italy*.

17:20 - 17:50: Reception and networking opportunities

17:50-19:30: Wolfgang Köhler in Tenerife (1913-1920): A Tribute to a Pioneer in Cognitive Psychology

Organizers:

Michel Denis. *CNRS / Université Paris-Saclay, France*

Carlos J. Álvarez. *Universidad de La Laguna, Spain*

The European Society for Cognitive Psychology has honoured Tenerife to being the venue of its 21st Conference. One century ago, the island of Tenerife was also the birthplace of one of the most daring research programs ever launched at the junction of primatology and psychology. Wolfgang Köhler collected a set of quite novel behavioural data that attested for the capacity of apes at solving problems and developing genuine thought processes. Köhler's work further inspired longstanding research efforts and initiatives in primatology and comparative psychology, prefiguring issues to be taken in charge by cognitive psychology decades later, including those related to young children's cognitive development. The symposium offers an exceptional opportunity of paying tribute to Wolfgang Köhler and presenting the results of a set of recent research programs in direct line with the spirit of Köhler's original scientific endeavour.

Introduction to the symposium

Carlos J. Álvarez

On behalf of the ESCoP-2019 organising committee

Köhler's years in Tenerife: Portrait of a man of science

Michel Denis. *CNRS / Université Paris-Saclay, France*

In 1913, Wolfgang Köhler left Frankfurt, where he had spent four years with Max Wertheimer and Kurt Koffka working out the basic tenets of the Gestalt theory. He moved to Tenerife to become director of the anthropoid research station founded a few years ago by the Prussian Academy of Sciences. It is here, at the Casa Amarilla, nearby Puerto de la Cruz, that he collected a considerable amount of evidence for non-human primates' problem solving and insight capacities, which he reported in his landmark book, "The Mentality of Apes". Whereas Köhler's dedication to primate research did not follow up in his further years back in Germany, then in the United States, his unique experience in Tenerife reflects the portrait of an exceptional scholar open to adventurous scientific challenges and innovative research methods, which have proven to be continuously inspiring for generations of cognitive psychologists.

Wolfgang Köhler's contribution to modern Comparative Psychology: Illustration with studies on abstract reasoning in baboons

Joël Fagot. *CNRS / Aix-Marseille Université, France*

It was during World War I that Wolfgang Köhler wrote the first edition of his famous book "The Mentality of Apes", when he was on Tenerife Island. That book was a turning point in animal psychological research. First, by showing that chimpanzees can exhibit intelligent behaviours in complex but accessible situations, Köhler contributed a response to "association theorists", like Edward Thorndike, who denied forms of reasoning in animals. Second, Wolfgang Köhler took the idea of Darwin that the difference between human and animal intelligence is a matter of degree, not of kind, and examined the "intelligent acts" of chimpanzees for gaining

some general knowledge on the mental processes shared by human and non-human primates, paving the way to modern Comparative Psychology. In this tribute to Wolfgang Köhler, I shall present a series of laboratory studies that demonstrate – in line with Köhler's pioneer studies on chimpanzees – forms of abstract thinking in baboons.

The role of others in primate social cognition

Stefanie Keupp. *University of Warwick, UK*

Wolfgang Köhler not only studied chimpanzees' instrumental problem solving and tool use but also their social-cognitive abilities. In the last decades, researchers of comparative cognition followed Köhler's approach to introduce new "problems" in the animals' environments to study the motivations and cognitive processes underlying their social behaviour. My research focuses on comparing how different primates use social information in their surroundings and their propensity to cooperate in joint activities. While humans have a strong motivation to cooperate with and compare themselves to others from very young age, competition plays a substantial role in non-human primates' social behavior and cognition. For example, when working concurrently on a task, human adults adapted their performance to the performance of a co-actor whereas long-tailed macaques were only interested in others' performance when the setting was competitive.

Insight and intuitive physics: Köhler on implicit knowledge

Juan-Carlos Gomez. *University of St. Andrews, UK*

One of the key contributions of Köhler's pioneering work on the intelligent behaviour of chimpanzees were the notions of insight and intuitive physics — the idea that the intelligent behaviour displayed by apes revealed some form of non-verbal "understanding" of the mechanics of the physical world irreducible to associative learning. In this paper I will review, first, the historical influence of this notion on the conceptions of intellectual development of Piaget and Vygotsky; and, building upon this, I will discuss its continuing relevance for the unresolved debates about the nature of animal and infant minds and their relation to the problem of "implicit knowledge" in current psychology and cognitive science.

Moment of truth: Can we trust our insights?

Amory H. Danek. *Heidelberg University, Germany*

The dawn of insight research dates back to Wolfgang Köhler's groundbreaking work on chimpanzee cognition. Köhler and the other Gestalt psychologists had postulated the infallibility of insight, yet this assumption was never systematically investigated. Their basic idea was that restructuring processes, as instances of "good thinking", inevitably lead to a better Gestalt, improving the original view of a problem and thus making it solvable. This view is reflected in Köhler's analogies with physical systems that converge towards stable states to form a dynamic equilibrium. However, it has only recently been shown that solutions with self-reported Aha! experiences are actually more likely to be correct than those where this feeling of epiphany is missing. A synthesis of recent studies shows that this intuitive sense of success holds across different task domains. Possible implications for creativity and problem solving will be discussed.



KEYNOTE LECTURES

To be held in the *Auditorio* hall



Keynote 1

Thursday 26th 9:00-10:00.

Remembering with the Benefit of Foresight

Anna Christina Nobre

Department of Experimental Psychology, Oxford. Centre for Human Brain Activity. Wellcome Centre for Integrative Neuroimaging, University of Oxford, UK

Most of attention research emphasises the forward arrow of attention, investigating how the anticipation of relevant items prepares the brain and modulates perceptual analysis of incoming sensory information. In this talk, I will expose the rearward arrow of attention, showing that attention also acts to prioritise and select items within memory according to our changing knowledge of the memoranda that may be important to guide performance. The findings raise interesting issues about the nature of and flexibility of memory as well as about the modulatory functions of attention.

Symposium: Temporal Attention.

Convened by Jan Theeuwes



Keynote 2

Friday 27th 9:00-10:00

Ecological Language: A Multimodal Approach to the Study of Language Learning and Processing

Gabriela Vigliocco

Department of Experimental Psychology, University College London (UCL), UK

The human brain has evolved the ability to support communication in complex and dynamic environments. In such environments, language is learned, and mostly used in face-to-face contexts in which processing and learning is based on multiple cues both linguistic and non-linguistic. Yet, our understanding of how language is learnt and processed comes for the most from reductionist approaches in which the multimodal signal is reduced to speech or text. I will introduce our current programme of research that investigates language in realworld settings in which learning and processing are intertwined and the listener/learner has access to —and therefore can advantage of— the multiple cues provided by the speaker. I will then describe studies that aim at characterising the distribution of the multimodal cues in the language used by caregivers when interacting with their children (mostly 2-3 years old) and provide data concerning how these cues are differentially distributed depending upon whether the child knows the objects being talked about (learning vs. processing), and whether the objects are present (situated vs. displaced). I will then move to a study using EEG addressing the question of how discourse but crucially also the non-linguistic cues modulate predictions about the next word in a sentence. I will conclude discussing the insights we have and (especially) can gain using this real world, more ecologically valid, approach to the study of language.

Symposium: Multimodality in Language Learning and Processing

Convened by Beata Grzyb & Yasmin Motanedi



Keynote 3

Friday 27th 14:40-15:40. What Controls Cognitive Control?

Senne Braem

Department of Experimental and Applied Psychology, Vrije Universiteit Brussel (VUB), Belgium

Much of human behavior is characterized by the extraordinary ability to quickly reconfigure our mind, inhibit prepotent responses, and switch between different tasks, often referred to as cognitive control. While most psychologists agree on what cognitive control is, we have only a poor understanding of its underlying mechanisms. When defining cognitive control, it is often contrasted with lowlevel learning. However, this talk will start from the idea that cognitive control functions are grounded in low-level learning mechanisms. I will present a set of studies suggesting that cognitive control functions are constantly evaluated, sensitive to reinforcement learning, and can be controlled by the context. Together, these results argue for a more integrative learning perspective on cognitive control.

Symposium: Recent advances in Cognitive Control Research.

Convened by Evie Verhauwe & Senne Braem



Keynote 4

Saturday 28th 9:00-10:00. Two Languages in one Brain

Manuel Carreiras

BCBL. Basque Center on Cognition, Brain and Language, Donostia-San Sebastián IKERBASQUE. Basque Foundation for Science. Bilbao. Universidad del País Vasco (UPV/EHU). Bilbao

A critical and long standing research question in the field of bilingualism is how two languages are represented in the bilingual mind and in the bilingual brain. A common semantic representation is nowadays accepted, while a lot of research also suggests a shared lexical representation. I will describe results advocating a non-selective cognitive architecture that can operate selectively under some circumstances, and how this cognitive architecture is modulated by the age of acquisition, input (comprehension vs. production) and language modality (two oral languages or the combination of an oral and a signed language). Furthermore, I will address the extent to which there is a neural overlap between the two languages considering the results of recent decoding approaches, whether the neural co-activation of the two languages depends on age of acquisition, input and modality, and whether the cognitive and neural findings regarding the representation of the two languages align.

Symposium: Bilingualism, Development and the Brain: A Neuroemergentist Perspective.
Convened by Arturo Hernandez



SYMPOSIUM SESSIONS. ABSTRACTS

SYMPOSIUM SESSION 1

Thursday 26th

11:30-13:10

SS1.AUD

Temporal Attention

Auditorio

Chair:

Jan Theeuwes
Vrije Universiteit Amsterdam
Institute Brain and Behavior Amsterdam (iBBA)

The brain constantly makes predictions about when, where and what sensory information is about to hit the retina. While previously the focus was on “where in visual space” attention needed to be directed, very recently the focus has shifted to “when in time” attention is needed. Temporal attention is about how the brain uses temporal and statistical regularities to guide behavior. The basic notion is that expectations in time help to set attention optimally for the incoming information thus providing optimal sensitivity for perception and action.

Speakers:

Sander Los
Antonino Vallesi
Freek van Ede
Bettina Rolke
Jan Theeuwes

SS1.AUD.1 The long and the short of temporal preparationSander Los^{1,2}, Wouter Kruijne³, Josh Salet³ & Martijn Meeter¹1. *Vrije Universiteit Amsterdam*2. *Institute Brain and Behavior Amsterdam (iBBA)*3. *University of Groningen*

In a warned reaction time task, the warning stimulus (S1) initiates a process of temporal preparation, which promotes a speeded response to the impending target stimulus (S2). When the S1-S2 interval (the foreperiod) is varied within blocks, past foreperiods affect preparation on subsequent trials at different time scales. An immediate effect on the next trial; an intermediate effect of the current foreperiod distribution, and long-lasting transfer effects after the distribution is changed. Classical models of temporal preparation (hazard function or trace conditioning) fail to account for all these effects. This inspired us to develop the multiple trace theory of temporal preparation (MTP). MTP assumes that each timing experience forms a unique memory trace, whose strength gradually dissipates toward an asymptote. On each trial, traces contribute to preparation proportional to their strength. We will show that these assumptions suffice to account for the complete family of foreperiod effects.

SS1.AUD.2 Bayesian modeling of temporal expectations in the human brainAntonino Vallesi^{1,2}, Antonino Visalli¹, Mariagrazia Capizzi¹, Ettore Ambrosini¹, & Ilaria Mazzonetto¹1. *University of Padova, Italy*2. *San Camillo Hospital IRCCS, Venice, Italy*

We used computational Bayesian modelling to quantitatively describe temporal expectations and to functionally disentangle belief updating from information surprise in order to best pinpoint the distinct functional anatomy (fMRI study) and electrophysiology (EEG studies) of cognitive processes associated with these two types of information. The fMRI results showed that specific regions belonging to the fronto-parietal and cingulo-opercular cognitive-control networks were differentially modulated by belief updating and surprise. The EEG results confirmed that updating and surprise could be functionally distinguished at the electrophysiological level, with relevant implications for the functional interpretation of the P3 within the framework of the Bayesian brain hypothesis. Overall, our findings contribute to enrich our current knowledge about the neural mechanisms underlying the deployment of temporal expectations.

SS1.AUD.3 Temporal anticipation in visual working memory

Freek van Ede

University of Oxford, UK

Foreknowledge of when sensations and actions are likely to occur or become relevant enables us to guide our attention toward them. To date, the influence of such 'temporal anticipation' has been most clearly demonstrated in the cognitive domains of perception and action. Little remains known about the role and mechanisms of temporal anticipation in working memory – despite the prospective purpose of this memory function and its proven susceptibility to other forms of attention. In my talk, I will use both behavioural and EEG data to highlight the mechanisms by which temporal anticipation ensures optimal working-memory-guided behaviour. These initial studies underline the important role of temporal anticipation also in the domain of visual working memory, and highlight the dynamic and pro-active nature of this core memory function.

SS1.AUD.4 The benefit of being in time: Does temporal attention selectively boost relevant stimulus features?

Bettina Rolke & Verena C. Seibold

University of Tübingen, Germany

Various studies have shown that temporal attention accelerates responses to a stimulus or enhances its discrimination. In two event-related potential studies, we addressed the question whether temporal attention fosters specific and task-relevant stimulus features. In Study 1, temporal attention was task-irrelevant, but other stimulus dimensions as the spatial position and the color were task-relevant. In Study 2, we defined the temporal occurrence of a stimulus itself as a task-relevant feature. We observed that temporal attention modulated stimulus processing in both studies, but that the interactive pattern of results differed between the studies. Temporal attention did not interact with the effects of other task-relevant dimensions when it was task-irrelevant (Study 1), but when it was task-relevant (Study 2). These results suggest that the influence of temporal attention on visual stimulus processing depends on its specific role in the task to be performed.

SS1.AUD.5 Anticipatory distractor suppression elicited by statistical regularities in visual search

Jan Theeuwes^{1,2} & Benchi Wang^{1,2}

1. *Vrije Universiteit Amsterdam*

2. *Institute Brain and Behavior Amsterdam (iBBA)*

Salient yet irrelevant objects often capture our attention and interfere with our daily tasks. Recent research has shown that implicit statistical regularities present in the display will bias attention. In the present talk, I will show that in anticipation of the stimulus, this attentional bias is already implemented before display onset. Using electroencephalography (EEG), we recorded cortical activity of human participants searching for a target while ignoring a salient distractor. We found that more than 1 sec prior to display onset, there was enhanced power in parieto-occipital alpha oscillations contralateral to the location where observers anticipated the occurrence of distracting information. After display onset, an early lateralized P1 component (~100 ms post-stimulus onset) was observed as an early anticipatory attentional index. Later in the trial, this was followed by distractor-related PD component suggesting suppression of the location where observers anticipated the presentation of a distracting information.

SS1.CIB
EWOMS Symposium.
Working Memory: Too Many Theories?

Cibeles Room

Chair:

Steve Majerus
Université de Liège, Belgium

The working memory research field has generated a wealth of theoretical models and frameworks over the past 40 years, with currently more than 20 theoretical proposals that co-exist. This has led to a rich set of experimental paradigms, but also to a significant state of theoretical confusion. The aim of this symposium is to take a theory neutral stance and to identify core empirical findings that any model of working memory should take into account. Each talk of this symposium will focus on critical aspects of working memory, such as its relationship with attention, its modal versus amodal nature, its relationship with language processing, the nature of serial order codes, and benchmark working memory effects. Each talk will identify core principles about the nature and functioning of working memory that, we hope, may lead to a more integrated and unified theory of the working memory concept.

Speakers:

Christian N.L. Olivers
Candice C. Morey
Steve Majerus
Tom Hartley
Klaus Oberauer

SS1.CIB.1 On the visual working memory - attention relationship

Christian N.L. Olivers

Vrije Universiteit Amsterdam, The Netherlands

From the conception of Baddeley's visuospatial sketchpad, visual working memory and visual attention have been closely linked concepts. An attractive model has been the one assuming unity of visual attention and working memory, with maintenance being based in the recruitment of sensory mechanisms. I will review evidence from different paradigms that in my view now firmly establishes an at least partial dissociation between visual attention and visual working memory maintenance. These paradigms include dual task interference, attentional set switching, and retro-cueing, and involve measures of behavioral performance as well as different attention-related and storage-related electrophysiological (EEG) signals. The data appear more compatible with a model in which attention serves to make a memory representation momentarily available for an operation or action. A measurable side effect of such action-related attentional tagging is then improved consolidation of plasticity-based memory traces.

SS1.CIB.2 Maintaining verbal information differs from maintaining visual information - but why?

Candice C. Morey

Cardiff University, United Kingdom

It is so clear that temporarily remembering verbal and visual information differs that dissociating how verbal and visual information are maintained is a prime goal of working memory models. Two robust and consistent lines of evidence illustrate how assumptions of both shared and specialized short-term stores are unsatisfying. First, verbal information can be held without dual-task cost from non-verbal information, which seems to suggest distinct stores. However, visual memories *are* impaired by diverse tasks, inconsistently with the assumption of a distinctly visual store. Second, maintenance itself does not necessarily impose a load. Performance on one task is not worse when participants successfully hold something else in mind. On the contrary, performance declines when concurrent memoranda are *incorrectly* recalled. This cannot be explained by assuming that storage occupies resources and prevents their allocation to another task. We shall consider how to advance explanations of working memory beyond this apparent impasse.

SS1.CIB.3 Theoretical integration of verbal working memory and language: Overlap and specificities

Steve Majerus

Université de Liège, Belgium

There is a broad range of working memory models, with one extreme assuming a complete overlap between verbal working memory and language systems while others assume at most indirect interactions between both systems. I will review behavioral, neuropsychological and neuroimaging evidence indicating not only that the language system can support several working memory functions but that access to language representations is a precondition for proper working memory maintenance, and this particularly for item information. I will further show that maintenance of serial order information is supported both by linguistic and non-linguistic processes. Based on these empirical findings, I will try to define the minimal degree of overlap between language and working memory any architecture of verbal working memory should take into account.

SS1.CIB.4 Theoretical integration in models of working memory and serial order: balancing convergent and divergent forces

Tom Hartley

University of York, United Kingdom

Considers whether and how disparate models of working memory (WM) can be integrated, with particular emphasis on the codes and mechanisms that underpin sequencing. In reviewing existing models, I will seek to identify general principles that would need to be incorporated into any integrated account, but I will also identify some challenges for theoretical integration. How should theoretical integration deal with domain-specificity and domain-generality within WM (e.g., verbal versus visuo-spatial sequencing), and with the possibility that WM control processes, including those responsible for serial order, may be shaped by more general functional requirements? I will argue that in order to address such challenges, a diversity of approaches can be healthy but that it should be counterbalanced by a drive to unify mechanistic explanations of different phenomena, to bridge levels of description, and to integrate models where possible.

SS1.CIB.5 Models of Working Memory: A Survey of the Landscape, and Routes Forward

Klaus Oberauer

University of Zurich, Switzerland

We have a wealth of empirical findings on working memory – more than any contemporary theory can explain. Last year, a team of researchers proposed a list of benchmark findings on working memory: Findings that are robust, general, and theoretically important, and that theories of working memory should aim to explain with high priority (Oberauer et al., 2018). Here I will ask how well our current theories do in explaining these benchmarks. I will try to identify clusters of explanatory successes and of explanatory gaps in the theory-by-benchmark matrix. This analysis should reveal areas in which existing theories have overlapping or complementary strengths and deficits, and show routes to theoretical progress through theory integration or development of new theories. Time permitting, I will also discuss the challenge of developing theories that are broad in scope – explaining a large and diverse set of findings – and precise at the same time.

SS1. EST**Does Core Cognition Structure Human Language?
The Case of Number Sense, Number Words, and Number Morphology*****Estambul Room***

Chairs:

Francesca Franzon

International School for Advanced Studies – SISSA

Chiara Zanini

University of Zurich

Rosa Rugani

University of Padova, University of Pennsylvania

Numerical cognition, the core ability to count entities, is crucial for survival: it allows to track the number of food items or social companions (Spelke, 2000). Basic numerical abilities do not need language —they are mastered by preverbal infants and non-human species as well. Yet, since numerical information is biologically salient, benefits follow from communicating about it to one's in-group (Corballis, 2017). Language shows efficient ways to encode this information, e.g. number words (*nineteen*). Also, this information is almost universally encoded in grammatical number (*singular-plural*): since it is mandatorily expressed, speakers just can't avoid conveying numerical information through language (Arcara et al., 2018; Franzon et al., 2018). What is the origin of these connections between core numerical information and number expression in language? In our symposium, scholars coming from different fields will tackle this issue from a wider evolutionary perspective and will explore whether and how numerical representation is accessed during language processing.

Speakers:

Brian Butterworth

Silvia Benavides-Varela

Alissa Ferry

Frank Domahs

Brent Strickland

SS1.EST.1 Counting and counting words

Brian Butterworth

University College London

Counting words are among the oldest words in all languages so far reconstructed (Pagel & Meade, 2018). It has been suggested that this is because all humans possess the idea of set size (cardinal number), the concept requiring verbal expression (Butterworth, Reeve, Reynolds, & Lloyd, 2008). But, perhaps even before counting words, humans, and possibly other hominins, enumerated by making marks on bones and stones (d'Errico et al., 2018). Nevertheless, learning to count with counting words is more complicated than it seems to most adults as it involves, calibrating preverbal representations of set size (Karolis & Butterworth, 2016), linking them to counting words, which in turn requires understanding how the counting words mean set sizes.

SS1.EST.2 On the limits of infants' auditory numerical representations

Silvia Benavides-Varela

University of Padova

Phonological memory is a prerequisite for language learning upon which fundamental skills such as word-sounds recognition and sentence comprehension heavily rely on. Numerous studies have addressed infants' representational abilities in the visual domain, however little is known about the properties in the verbal domain. This study investigated 10-month-olds' (N = 54) ability to represent syllable sets on the basis of their numerosity. The results indicate that, in a working memory task, infants distinguish and separately represent 2 and 3 syllable-sets both when the sets differed in the overall duration (Exp. 1) and when edited to have identical duration (Exp. 2). However, infants fail to represent 3 and 4 syllable-sets as distinct (Exp. 3). These results parallel previous studies showing visual discrimination abilities of 2/3 ratios in 9-month-olds and capacity limits of about 4 items in 12-month-olds. This suggests that early memory capacities might be comparable across visual and auditory domains.

SS1.EST.3 Twelve to 24-month-olds can understand the meaning of morphological regularities in their language

Alissa Ferry

University of Manchester

To learn a language, infants must link sounds to meaning. While words are a clear example, morphological regularities (e.g., the plural -s suffix in English) also carry meaning. Here, we investigated infants learning Italian, a language with a rich inflectional morphology that marks gender and number. Italian-learning 12-18- and 24-month-olds were shown pairs of images of faces that differed either in number (1 female vs. 2 females; 1 male vs. 2 males) or gender (1 female vs. 1 male; 2 females vs. 2 males). Infants were directed to look at one of the images with the morphological regularities as the only distinguishing cue. Across all ages, the infants looked to the labelled image, indicating that they understood the distinctions. Thus, in the early stages of language acquisition, infants are able to identify recurring morphemes and to map those morphological regularities to the concepts that they mark in the language.

SS1.EST.4 Semantic interpretation of grammatical number

Frank Domahs

Philipps-University Marburg; University of Erfurt

The grammatical category *number* is marked on different word types, including nouns. Beyond their syntactic function, grammatical number distinctions (singular vs. plural) typically correspond to the actual count of the referents (one vs. many). Therefore, the semantic interpretation of grammatical number basically evokes a quantity meaning. The present talk will try to shed some light on this process. I will present data from studies using behavioral methods, functional magnetic resonance imaging and voxel-based lesion-symptom mapping with healthy participants and brain-damaged patients. Based on these findings, I will come to the following conclusions: Semantic interpretation of grammatical number occurs in a task-dependent way. In languages with complex morphological paradigms of grammatical number (e.g., German), it proceeds in a probabilistic fashion, using a combination of cues of different validity. Neuroanatomically, similar areas (in particular the left inferior parietal lobe) are involved both in the interpretation of grammatical number and in numerical tasks.

SS1.EST.5 Core cognition and learnability: A possible explanation for cross-linguistic similarities

Brent Strickland

CNRS - Ecole Normale Supérieure

Languages regularly contain grammatical categories with a semantic basis in “core” concepts (Spelke & Kinzler, 2007) such as the basic distinctions between male/female, human/non-human, and animate/inanimate (WALS, 2018). Here we explored the possibility that linguistic rules based on core distinctions are easier to acquire than those based on non-core distinctions, and therefore they are more likely to appear cross-linguistically. To test this, participants were tasked with learning grammatical markers for plural endings (Exp. 1), pronouns (Exp. 2), or determiners (Exp. 2) in an artificial language learning paradigm. These markers could map either onto core distinctions (animate/inanimate, human/non-human, male/female) or non-core distinctions (e.g. vehicles/non-vehicles, furniture/non-furniture). We found that participants more readily acquired artificial grammatical distinctions that mapped onto “core” semantic distinctions than those that mapped onto non-core distinctions. These results suggest that cross-linguistic grammatical regularities may be rooted in more basic cognitive distinctions that are common across the human species.

SS1.ATE**Time for Embodiment – New Evidence for the Time Course of Bodily Reference in Cognition*****Atenas Room***

Chairs

Tatjana A. Nazir

Université Claude Bernard Lyon1, Bron, France

Martin H. Fischer

University of Potsdam, Germany

Embodied cognition has become an influential theoretical framework for our understanding of the human mind. Nevertheless, there are few fully developed models around and this is partially a result of an under-specification of the time course of embodiment signatures. This symposium brings together five international experts who have applied a range of highly time-resolved methods to the task of understanding cognition with a view towards embodiment. Their results will provide reference points for a broader discussion with members of the audience at the end of the symposium.

Speakers:

Matias Bertonatti

Tatjana A. Nazir

Marloes Mak

Bo Yao

Martin H. Fischer

SS1.ATE.1 Interaction with food pictures elicits focused attention during food deprivation

Matias Bertonatti,¹ Weymar, M.², Sommer, W.¹, & Fischer, M.H.²

1. *Humboldt-University at Berlin, Germany.*

2 *University of Potsdam, Germany.*

Food deprivation motivates goal-directed actions towards food items. The objective of this research was to determine whether reachability judgments are influenced by satiation/hunger states. Event-related brain potentials (ERPs) were measured in order to explore whether this interaction is associated with food recognition and focused attention. Twenty-two (16 females) right-handed, omnivorous, normal-weight participants in satiation or hunger states estimated the reachability of pictures of food items, projected onto a horizontal plane while ERPs were recorded. Peripersonal space elicited by food pictures was perceived as wider in the hunger condition. This was associated with increased late positive ERP potentials from ~ 350–600 ms compared to the satiated state. Our findings suggest that food deprivation enhances the desire and motivation to physically interact with food and increases focused attention, translated to restore depleted energy levels of the body.

SS1.ATE.2 Linguistically implicit meaning drives language-induced activity in modality-specific brain structures

Tatjana A. Nazir, Lianna Hrycyk, Yves Paulignan, Jacques Jayez, & Anne Reboul

Université Claude Bernard Lyon1, Bron, France

Many studies demonstrated that modality-specific brain structures can be active during the processing of words referring to perception and action. While this fact was initially interpreted as evidence for the contribution of these structures to the elaboration of word meaning, ensuing studies progressively dampened the excitement. This is mainly because for the same word activity in modality-specific structures is not *always* present. Despite of this flexibility it seems unlikely though that the recruitment of these structures has no significant functions. Specifying linguistic conditions under which the phenomenon occurs is thus critical for its understanding. Here we manipulated the question that is raised within a particular linguistic context – cf. the “question under discussion” (QUD) – and show that language recruits motor brain structures only when the *primary* conveyed information is the action. Activity in these brain structures thus hinge on principles of pragmatics and could help elaborating speaker’s communicative goals.

SS1.ATE.3 Eye-tracking narrative reading: Individual roles of perceptual simulation, motor simulation and mentalizing.

Marloes Mak¹ & Roel M. Willems^{1,2,3}

1. *Radboud University, Nijmegen, The Netherlands*

2. *Radboud University, Nijmegen, The Netherlands*

3. *Max Planck Institute for Psycholinguistics, Nijmegen, The Netherlands*

People engage in simulation when reading literary narratives. This eye-tracking study aimed to differentiate the roles of perceptual simulation, motor simulation and mentalizing in determining reading behavior. 102 participants read three short stories, which 90 different participants in a pre-test had rated for motor simulation-eliciting content (n=30), perceptual simulation-eliciting content (n=30) or mentalizing-eliciting content (n=30; resulting in scores of 0-30 per type of simulation-eliciting content, per word). The results show that motor simulation reduces gaze duration (faster reading), whereas perceptual simulation and mentalizing increase gaze duration (slower reading). Individual differences in the effect of simulation on gaze duration were found, which were related to individual differences in subjective reading experiences. These findings

suggest that the processes leading to simulation differ between kinds of simulation. Additionally, this study showcases how eye-tracking can be used to investigate embodied experiences during narrative reading.

SS1.ATE.4 Temporal dynamics of mentally simulated speech in silent reading

Bo Yao

University of Manchester, UK

Theories of embodied cognition propose that cognition is constrained in the body's interaction with the world. In language research, a vast body of work suggests semantic representation and processing broadly depend on mental simulation (re-enactment) of one's sensory and motor experience. What remains neglected, however, is how mental simulation unfolds in real time. Our research shows that mental simulation is a dynamic process: Mental simulation of quoted speech (e.g., "I am hungry!") interacts with real-time eye movements during silent reading; it also elicits neurophysiological signatures that reflect the temporal structure of real speech. With this dataset, I hope to illustrate that mental simulation is dynamic and time-sensitive and suggest that we should consider the time constraints in a real environment when developing embodied cognition theories.

SS1.ATE.5 What have we got and what do we need? Q&A with the audience

Martin H. Fischer

University of Potsdam, Germany

The last time slot of the symposium is dedicated to a more detailed discussion of requirements for viable models of the time course of embodiment signatures in human cognition. Inspired by computational work (e.g., Chersi et al., 2010; Pezzulo et al., 2013) and neuroscientific evidence (e.g., Pulvermüller, 2018), we can together decide what constitutes current strong and weak points of the embodied approach to cognition and perhaps agree on the designs of valuable future experiments.

SS1.StT
**Acting in a Complex World – Emerging Perspectives
on Human Agency**

Saint Tropez Room

Chairs:

Katharina A. Schwarz
University of Würzburg, Germany

Nura Sidarus
Ecole Normal Supérieure, Paris, France

Roland Pfister
University of Würzburg, Germany

Humans experience a vivid sense of agency for their actions and the consequences of those actions. This is foundational for causally attributing events to oneself or others, and for feelings of responsibility and regret. This symposium brings together emerging perspectives on the cognitive mechanisms that give rise to the sense of agency and, conversely, on the downstream consequences of experienced agency for cognition and behaviour. We first outline a novel framework for agency (Wolpe) and innovative methods for exploring agency in the laboratory (Polito). Next, we explore how the experience of agency impacts action-outcome learning (Sidarus). We conclude by assessing how sense of agency functions in collaborative and hierarchical social interactions (Van de Wel, Schwarz). This symposium will provide a comprehensive view on agency research, hopefully stimulating future research into this exciting facet of human experience.

Speakers:

Roland Pfister
Vince Polito
Nura Sidarus
Rob Van de Wel
Katharina A. Schwarz

SS1.StT.1 Something from nothing: Agency for deliberate nonactions

Roland Pfister, Wilfried Kunde, Katharina A. Schwarz, & Lisa Weller

University of Würzburg, Germany

Several law systems punish non-actions such as failures to render assistance, although it is unknown if and how people spontaneously experience agency and responsibility for the consequences of their not acting. We will present evidence that events caused by deliberate choices not to act indeed give rise to a vivid sense of agency. This was true not only for subjective judgments also for implicit measures of temporal binding, indicating that sense of agency is not confined to overt body movements. These results replicated in two follow-up studies. At the same time, agency was more pronounced when the same event resulted from an action rather than being the consequence of a non-action, highlighting the importance of ascribing different degrees of subjective responsibility for the consequences of acting and not acting.

SS1. StT.2 Hypnotic models of passivity delusions as a window in to the sense of agency

Vince Polito & Amanda Barnier

Macquarie University, Sydney, Australia

Hypnotised individuals often experience agency alterations whereby their actions feel effortless. This has led researchers to develop functional models of psychopathology involving hypnotic suggestions for cognitive alterations, based on the features of clinical conditions. I will report a study in which hypnotic models of control delusions were used to alter participants' sense of agency for automatic actions. Wegner et al. (2003) found that participants were unable to suppress correct answers in a trivia quiz when instructed to respond randomly. In a hypnotic adaptation, I gave participants suggestions based on alien control and thought insertion delusions as alternative strategies for responding in a trivia quiz. Thought insertion participants answered most questions correctly, but were unaware of doing so. Alien control participants were able to suppress correct responding and instead gave random answers. These results demonstrate that hypnosis can alter metacognitive awareness of actions and lead to changes in otherwise uncontrollable behaviours.

SS1. StT.3 Against your will: how learning is influenced by conflict between instructions and subjective beliefs

Nura Sidarus

Ecole Normale Supérieure, Paris, France

Goal-directed action requires learning which actions will yield desirable outcomes. Besides learning from our free choices, we may also benefit from learning from instructed actions. But what happens if we have to follow instructions that we disagree with? We investigated how learning is influenced by having a choice in what to do, and by conflict between instructions and subjective beliefs about action values. Participants completed a reversal-learning task. Using computational models of reinforcement learning, we estimated the accumulated, subjective action values, and assessed differences in learning rates across conditions. Results showed that learning rates were reduced for instructed than for freely chosen actions. Learning rates were further reduced by conflict between instructions and subjective action values. These findings suggest that being forced to go against our will carries a cost to learning. This has implications for how our experience of agency shapes our interactions with the external world.

SS1. StT.4 Acting jointly: Do “we” exist and when?**Rob Van de Wel***Rutgers University, Camden, USA*

Our world is filled with actions that take place in complex contexts involving other intentional agents. Acting jointly enables us to accomplish many action goals we could not accomplish alone. Joint control also inherently introduces ambiguities in deriving a sense of control. Understanding the experiential nature of joint actions is important, as misperceptions of control may result in unduly claiming credit. In egregious cases, this may obviate a willingness to act jointly altogether. Here, I will explore what we know about the sense of control in joint tasks. I will discuss evidence suggestive of we-mode control and explore how different roles in joint actions impact the joint sense of control. I will also discuss how the available coordination modalities, the action smoothness and the quality and reward of the action outcome impact the sense of control. Both predictive and postdictive influences on the joint sense of control will be explored.

SS1. StT.5 Acting in hierarchical structures: Agency, responsibility, and regret**Katharina A. Schwarz, Roland Pfister, & Wilfried Kunde***University of Würzburg, Germany*

The sense of agency is a crucial mental state for human beings and their functioning in society. It is directly linked to feelings of responsibility and also to feelings of regret over undesired action outcomes, both important functions that govern social interactions and permeate our understanding of justice and law. The question of agency becomes especially interesting when agency is not limited to a single agent, but takes social interactions into account. Here, we present evidence from multi-agent studies exploring how hierarchical structures, status, outcome, and degrees of freedom affect feelings of agency, responsibility, and regret for those actions. Who feels responsible for an action – the person who decides upon its execution or the person executing it? How are judgments of responsibility and regret modulated by the agent's degrees of freedom during the action? These questions open up a novel, exciting approach to the sense of agency in real-life settings.

SS1.TAR**Integrated and Flexible Spatial Representations: Who Makes Them (When and How), and Why They Are Important*****Tarraco Room***

Chair:

Nora S. Newcombe
Temple University

People get lost. Even when they do not, they often complain about the difficulty of navigation. Indeed, much research on spatial encoding for wayfinding has found that people show rigid and fragmentary knowledge of the locations of objects and buildings. These five presentations explore the conditions under which knowledge becomes more integrated and flexible, and why such flexibility is important in two translational contexts, aging and fire safety.

Speakers:

Nora S. Newcombe
Jan Wiener
Allison Jaeger
Vladislava Segen
Hantao Zhao

SS1.TAR.1 Active movement enhances spatial flexibilityCorinne Holmes¹, Nora S. Newcombe², Thomas F. Shipley, Merve Tansan, & Mia Velazquez1. *Trinity College Dublin*2. *Temple University*

Recalling a spatial layout from multiple orientations – spatial flexibility – is challenging, especially when people view an environment sequentially, without a visual overview. In a series of studies, we have used an integrated tabletop display (park-like panorama) or an array of dollhouse furniture that was either viewed together or sequentially (using partitioned viewpoints). Participants have either rotated the array or moved around it, actively or passively, with a variety of control conditions and dependent variables. Across four experiments, we find that a stable array results in more flexibility than rotated arrays, and that active walking significantly enhances spatial recall relative to passive movement, array rotation or controls, when the array is partitioned. These findings suggest that array stability is key to flexible spatial memory, with action providing an additional boost to spatial integration when it becomes more challenging. In a fifth experiment, we examine integration between spaces not directly experienced.

SS1.TAR.2 When route navigation requires spatial flexibility: Retracing a route from the destination to the start

Jan Wiener, Ciera Basset, Sophie Bentall, & Chiarra Black

Bournemouth University

Abstract: Route navigation is typically conceptualised as a series of recognition triggered responses. i.e., landmarks are associated with behaviours (e.g., “Turn right at red house”). Such stimulus-response (S-R) knowledge is sufficient when repeating a route. It is, however, not sufficient when approaching intersections from novel directions, including retracing a route from the destination back to the start. I will present a novel and free route test battery developed to investigate the cognitive strategies involved in repeating and re-tracing routes (<https://osf.io/mx52y/>). We manipulated the travel direction (repetition vs. retrace) and whether intersections were shown in the same order as training or in a random order. Performance and response time analyses show that (1) route retracing is not achieved by simply mirroring directional responses encoded during learning, and (2) participants use a combination of S-R and sequence learning strategies in the ‘repetition same’ condition but not in any other condition.

SS1.TAR.3 Map sketching and map viewing: Do they enhance spatial integration?Allison Jaeger¹, Alina Nazareth, Nora S. Newcombe², Thomas F. Shipley, & Steven M. Weisberg1. *St. John's University*2. *Temple University*

Abstract: Verbal descriptions are categorical and sequential and hence do not align well with the demands of representing simultaneous analogue relationships. Thus, generating sketches should be better than generating verbal descriptions for helping people to build integrated knowledge, and similarly viewing maps should be better than listening to verbal descriptions. In Study 1, 156 participants explored a virtual environment (VE) including independent and connecting routes, then sketched or wrote a summary describing the layout, followed by free exploration and a pointing task and a model-building task. Participants who generated sketches provided significantly more target and route details than those who generated written summaries and spatial cognitive style correlated with quality of both representations. However, neither sketching nor written summaries positively influenced spatial integration relative to controls. In Study 2, we are examining the effects of viewing maps versus reading written descriptions.

SS1.TAR.4 Flexibility of place recognition in older adults

Vladislava Segen, Marios Avraamides, Timothy J. Slattery, & Jan Wiener

Bournemouth University

Efficient navigation depends largely on spatial memory, i.e., the ability to remember where things are located in the environment. As shown by past research, this ability declines with age. In an attempt to characterise the exact nature of age-related deficits in spatial memory, we conducted a series of experiments in which older and younger participants viewed arrays of objects depicted on a computer screen and judged whether test arrays presented afterwards were the same or different. These experiments included manipulations aimed at assessing spatial flexibility across the two age groups (by introducing a perspective shift between the study and test array). We also evaluate the fine-grain and categorical processing of spatial information (by rotating the array relative to the enclosing space or swapping the locations of object clusters). Behavioural results and gaze data from these experiments will be presented and discussed in the context of spatial flexibility in the ageing.

SS1.TAR.5 Fire evacuation using adaptive signage in virtual reality

Hantao Zhao, Amray Schwabe, Tyler Thrash, Joonas Karjalainen, Christoph Hoelscher, Dirk Helbing, & Victor R. Schinazi

ETH-Zurich

Fires in built structures are a pervasive problem for many metropolitan areas, causing several casualties everyday in Europe. Fire deaths have been linked to navigation-related issues such as suboptimal signage. Most interventions have focused on the saliency of signs, but adaptive signs may help resolve wayfinding difficulties by routing patrons to the optimal exit in relation to the distribution of an emergency. In this experiment, we compared the efficiency and effectiveness of adaptive and conventional signage during a fire evacuation in a virtual museum. Participants explored a virtual museum until a virtual fire was suddenly triggered. Subsequently, they were asked to evacuate as quickly as possible. The results revealed that participants in the adaptive signs group evacuated more quickly, used shorter routes, suffered less damage to their "health", and reported less distress. Preliminary analyses of physiological data also revealed that participants were less psychologically aroused in the adaptive signs group.

SS1.BAR

Auditory Cortical Entrainment in Relation with Language Processing

Barcelona Room

Chair:

Nicola Molinaro

BCBL, Basque center on Cognition, Brain and Language

In listening conditions, the oscillatory brain activity synchronizes with the rhythmic properties of the external input. This so-called “auditory entrainment” is assumed to play a crucial role in auditory perception, since it can constitute a mechanism through which the brain internally represents the temporal properties of the external stimulus. Interestingly, during speech perception, this phenomenon has been observed to involve not only the primary auditory cortex, but also higher-order regions in the parietal and the frontal lobes. Recent studies investigated which components of speech entrainment are driven by the acoustic properties of speech and how this phenomenon is penetrated by top-down influences based on linguistic knowledge. The present symposium offers an overview of this new set of findings thus opening the window to the development of more sophisticated neurocognitive approaches to the speech entrainment phenomenon.

Speakers:

Anne Keitel

Hans Rutger Bosker

Anne Kösem

Nicola Molinaro

Lars Meyer

SS1.BAR.1 The importance of word-level segmentation and representation for auditory and visual speech comprehension

Anne Keitel

University of Glasgow, UK; University of Dundee, UK

The neural tracking of auditory speech (often called “entrainment”) is an essential, low-level aspect of comprehending continuous speech. The speech stream is hereby segmented into linguistic units, such as syllables, words or phrases. We could recently show that this neural segmentation directly predicts comprehension of speech-in-noise at two different timescales and in distinguishable brain areas. The segmentation into phrases originated in motor areas and seems to be based on acoustic temporal cues in speech. The segmentation into words originated in temporal areas, where the mapping of meaning to words occurs. We corroborate the importance of these temporal areas specifically for representing word identities with a new decoding approach. Interestingly, during lipreading, the areas that represent visual word identities are largely distinct from auditory word identities and only converge in higher-order language areas. Our results highlight and disentangle the importance of word-level segmentation and representation for auditory and visual speech comprehension.

SS1.BAR.2 Normalizing speech sounds for surrounding context: Charting the role of neural oscillations

Hans Rutger Bosker

Max Planck Institute for Psycholinguistics, Nijmegen, The Netherlands

The way speech sounds are pronounced in everyday conversations is remarkably variable. If 10 talkers pronounce the same sentence, you’ll end up with 10 acoustically unique realizations. Listeners cope with this acoustic variability by normalizing speech segments for surrounding temporal and spectral characteristics. That is, a given speech sound can be perceived differently depending on, for instance, the preceding sentence’s speech rate, or average formant values. I will present evidence that these normalization processes occur very early in perceptual processing. Also, I will argue that temporal normalization may be explained by a neural mechanism involving cortical theta oscillators phase-locking to the syllabic rate of speech. Entrainment at different frequencies (e.g., fast vs. slow speech rates) is argued to impose differential cortical sampling regimes unto the sensory signal, influencing the perception of the duration of subsequent speech sounds. Thus, I propose a neurobiologically plausible model of acoustic normalization in speech processing.

SS1.BAR.3 Neural entrainment influences perceived speech content

Anne Kösem

Université Claude Bernard Lyon 1, Lyon, France

While neural oscillations are known to entrain to the dynamics of speech, it is debated whether this entrainment supports the neural mechanism involved in speech processing. Here, I will discuss evidence that entrained oscillations build temporal predictions about the duration of speech tokens that affect perception. I will show that the neural entrainment to ongoing speech can be influenced either by preceding speech rate information, or by non-invasive transcranial alternating current stimulation. In both studies, the modulations in neural entrainment have direct consequences for the perceived duration of speech acoustic tokens, which determines the identity of the words that are subsequently perceived. The present findings thus link neuronal dynamics to speech processing by demonstrating a causal role of brain oscillations in the perception of spoken language.

SS1.BAR.4. Auditory entrainment is modulated by language proficiency

Nicola Molinaro & Mikel Lizarazu

Basque Center on Cognition, Brain and Language (BCBL), Spain

Auditory entrainment during speech perception has been identified as a basic mechanism through which the human listener extracts abstract language information from the acoustic input. Auditory entrainment is a multi-level mechanism in which the brain simultaneously tracks multiple sources of information that evolve in parallel in differently-sized temporal windows (i.e., different frequency bands). Each frequency band reflects language information with different granularity, such as prosodic, syllabic, and phonemic information. Whether such cortical mechanisms are sensitive to the "language knowledge" of the listener is still a matter of debate. We evaluate speech tracking in a second language in three groups of listeners with advanced, intermediate and basic proficiency. We observe a parametric modulation of the speech tracking at the prosodic and syllabic level that, in turn, affects phoneme tracking. These findings highlight the complex cortical dynamics supporting speech perception, showing that language knowledge is crucial for accurate speech tracking.

SS1.BAR.5. Endogenous neural oscillations during the generation of linguistic representations: Evidence from electroencephalography and transcranial magnetic stimulation

Lars Meyer

Max Planck Institute for Human Cognitive and Brain Sciences, Leipzig, Germany

Synchronization of neural oscillations with auditory information has been argued to be critical for auditory speech processing. Yet, neural oscillations do not only track bottom-up acoustic information but can also subserve domain-general or even linguistic top-down functions. In an exemplary electroencephalography study using ambiguous sentences, we found slow-frequency oscillations to phase-lock to internally generated linguistic representations rather than external auditory information. Critically, perturbation of the underlying cortical areas using transcranial magnetic stimulation was found to modulate this tendency to ignore external auditory information—suggesting that endogenous oscillations can causally influence speech processing. Hence, in addition to the well-known role of exogenous oscillations in auditory processing, endogenous oscillatory activity may underlie the generation of internal linguistic representations that may—for example, in ambiguous situations—dominate speech processing.

SS1.PAL

Development and Plasticity of Executive Functions

Palma de Mallorca Room

Chairs:

Julia Karbach
University of Koblenz-Landau
Tanja Könen
University of Koblenz-Landau
Tilo Strobach
Medical School Hamburg

Executive functions (EF; working memory, inhibition, flexibility and dual tasking) show significant developmental progress across childhood and mature well into adolescence. Given that they are excellent predictors for various life outcomes, such as academic success, social behavior and health, recent years have seen an immense interest in their development and plasticity, both by short interventions and intense training regimes. Current work shows that individual differences in their effects are massive and highlight the importance of understanding the mechanisms driving development and plasticity of EF. We present five studies approaching these questions from different angles. Tilo Strobach assessed the development of dual-task interference and Tanja Könen focused on the effects of induced affect on working-memory performance in childhood. Nikolaus Steinbeis and Verena Johann investigated the effects of EF training on academic abilities in children. Nachshon Meiran examined mechanisms underlying the plasticity of EF by analyzing individual differences in working-memory training gains.

Speakers:

Tilo Strobach
Tanja Könen
Nikolaus Steinbeis
Verena Johann
Nachshon Meiran

SS1.PAL.1 Specifying the development of dual-task interferenceTilo Strobach¹ & Julia Karbach^{2,3}1. *Medical School Hamburg, Hamburg, Germany.*2. *University of Koblenz-Landau, Landau, Germany.*3. *Center for Research on Individual Development and Adaptive Education of Children at Risk (IDeA), Frankfurt, Germany*

Performing two tasks simultaneously in dual-task situations leads to increased processing times and/or error rates compared to single tasks with separate task performance (i.e., dual-task costs). Previous studies demonstrated that these dual-task costs are even higher in children than in young adults. However, these studies did not specify the mechanisms explaining these higher dual-task costs and did not assess the specific task processes that particularly interfere simultaneous task performance in children. To assess this interference in children (N = 30) and young adults (N = 30), we combined sensorimotor tasks in dual tasks of the psychological refractory period (PRP) type and compared age-related differences in interference at perceptual, response-selection, and motor processes. The results provided evidence for interference at response-selection processes in both age groups and indications for additional perceptual interference in children. We discuss the data in the context of the locus-of-slack logic.

SS1.PAL.2 Induced affect does not modulate working-memory performance in middle childhoodTanja Könen^{1,2} & Julia Karbach^{1,2}1. *University of Koblenz-Landau, Landau, German.*2. *Center for Research on Individual Development and Adaptive Education of Children at Risk (IDeA), Frankfurt, Germany*

All working memory (WM) models agree that WM capacity is limited and that reliable individual differences exist. Recent research also demonstrated reliable within-person performance variability. Affect has been discussed as a predictor of WM performance. It was discussed whether both positive and negative affect induce cognitive load and thus reduce WM performance (suppression hypothesis), or whether positive affect might enhance performance (facilitation hypothesis). However, no controlled test with children existed so far. In a sample of 330 elementary school children (age: M=9.2, SD=0.8, range 8–11) we induced positive vs. negative affect with film clips and compared children's WM performance pre and post induction with a neutral film condition. Although the manipulation significantly induced affect as expected, no significant impact of affect on WM performance was found. Thus, our findings suggest that affect does not modulate children's WM performance causally, although both have been found to co-vary in correlational designs.

SS1.PAL.3 What cognitive training can tell us about the development of executive functions

Nikolaus Steinbeis

University College London, United Kingdom

There is much debate whether executive functions can be improved by means of dedicated interventions. Further, it remains controversial whether inhibitory control comprises so-called stop processes or can be accounted for monitoring. We addressed these questions by means of a training paradigm in 60 typically developing children (mean age = 9.3 years, SD = 0.5). We employed a prepost intervention design (average 20 training sessions). Children were trained either on inhibition, context monitoring or response speed. Each training paradigm was adaptive to children's performance on any given trial and session. Performance on measures of intelligence, reading and maths and executive functions was compared pre-post training. It was found that executive functions can indeed be improved as indexed by training-related gains in each group.

Further, there were differential effects of inhibition and context monitoring training on near- and far-transfer tasks, suggesting these to be dissociable processes at least in development.

SS1.PAL.4 Effects of game-based and standard executive control training on cognitive and academic abilities in elementary school children

Verena Johann^{1,2} & Julia Karbach^{1,2}

1. *University of Koblenz-Landau, Germany.*

2. *Center for Research on Individual Development and Adaptive Education of Children at Risk (IDeA), Frankfurt, Germany.*

This study compared the effects of game-based and standard training regimens targeting WM, inhibition or flexibility on cognitive and academic abilities in children. 153 typically developing children (mean age = 9.6 years, SD = 0.8) were investigated in a pretest-training-posttest-follow-up design and were randomized into one of six training groups (WM training game-based/standard, inhibition training game-based/standard, flexibility training game-based/standard) or a control group. We found training gains in all training groups and higher self-reported motivation in the game-based as compared to the standard training groups. There was domain-specific transfer to untrained EF tasks across all training groups. Furthermore, we found greater performance improvements in reading ability in the game-based flexibility training group and the game-based inhibition training group as compared to the control group. In sum, our findings provide first evidence for a systematic comparison of training on different domains of EF and their differential effects on academic abilities.

SS1.PAL.5 Mechanisms of working memory training: Insights from individual differences

Nachshon Meiran¹, Gesine Dreisbach², & Claudia von Bastian³

1. *Ben-Gurion University of the Negev, Beer-Sheva, Israel.*

2. *Regensburg University, Regensburg, Germany.*

3. *University of Sheffield, Sheffield, UK*

Computerized working-memory training (WM), despite yielding large practice effects in the training task, barely transfers to Fluid Intelligence (Gf). We hypothesized that training tasks gradually become less related to Gf due to task-specific skills so that what is being eventually trained is weakly related to WM and Gf. We thus predicted a gradual change in the rank-ordering of individuals (quasi-simplex) in the per-session scores of the training task coupled with a trend in reduction in Gf loadings. Reanalysis of results from two published studies confirm the predicted quasi-simplex pattern. However, contrary to the prediction, the training tasks maintained or even tended to increase their Gf loading with training progression. We provide post-hoc accounts for these results, some which challenge prevalent assumptions beyond the attempt to improve Gf through improving WM.

SYMPOSIUM SESSION 2

Friday 27th

11:30-13:10

SS2.AUD

Multimodality in Language Learning and Processing

Auditorio

Chairs:

Beata Grzyb
Yasamin Motamedi
University College London, UK

In the language sciences, there is an increasing recognition of the multimodal nature of language—that human language is more than just decontextualized, rule-governed speech. Languages, both spoken and signed, are primarily used in face-to-face communication, comprising a dynamic system of multiplex components in addition to structured speech and sign: gesture, facial expression, eye gaze and prosodic modulation. A growing body of research aims to model language as a multimodal system, accounting for the effects of multiple channels on language learning and processing beyond speech alone. This symposium aims to highlight the importance of building multimodal models of language, showcasing a range of theoretical and methodological perspectives on multimodality, from child language development, neuroimaging, sign language research and computational modelling.

Speakers:

Reyhan Furman
Henning Holle
David Peeters
Tessa Verhoef
Beata Grzyb

SS2.AUD.1 Do you see what I mean?: Bilingual and monolingual children use iconic gestures in speech disambiguation

Reyhan Furman

University of Central Lancashire, UK

Everyday language is rife with verbal ambiguity. One way listeners can deal with this problem is through using a speaker's gestures as disambiguation cues. For instance, adult listeners use the information in a speaker's iconic gestures to resolve lexical ambiguities in speech and to disambiguate the dominant and subordinate meanings of homonyms (e.g. *bat* to mean an animal or a sports instrument) (Holle & Gunter, 2007). Currently, we know very little about whether children can benefit from a speaker's gestures to resolve lexical ambiguities in speech. The only study that has investigated the developmental role gesture plays in the resolution of lexical ambiguity has focused on how children produce gestures to disambiguate homonym senses. Kidd and Holler (2009) found that while 3-year-olds rarely disambiguated between different senses, 4-year-olds used iconic gestures to do so. In two studies, we asked whether a speaker's iconic gestures help children resolve lexical ambiguity in speech. Monolingual (English) and bilingual (English-French) children aged 4 watched videoclips where a speaker uttered a sentence containing a homonym (e.g. *The glasses fell on the floor and broke*) that was accompanied either by a cospeech iconic gesture, or no gesture. Children were then given pictures that depicted the dominant and subordinate senses of the homonym and asked to choose which sense the speaker referred to. Our results show that children often had a preference for one of the senses of the homonyms, regardless whether this dominant sense was accompanied by a gesture. In contrast, the presence of iconic gestures significantly increased children's preference for the subordinate senses of homonyms. The results indicate that children benefit from speakers' gestures selectively, only using them to comprehend senses that they would otherwise ignore. Seeing different homonym senses represented in gesture might help young children better understand that one-to-many mappings are possible in language, and allow them to zoom in on senses that they have not yet fully acquired.

References

Holle, H., & Gunter, T.C. (2007). The role of iconic gestures in speech disambiguation: ERP evidence. *Journal of Cognitive Neuroscience*, 19, 1175-1192.

Kidd, E., & Holler, J. (2009). Children's use of gesture to resolve lexical ambiguity. *Developmental Science*, 12, 903-913.

SS2.AUD.2 Identifying linguistic and neural levels of interaction between gesture and speech during comprehension using EEG, fMRI and TMS

Henning Holle

University of Hull, UK

Conversational gestures are hand movements that co-occur with speech but do not appear to be consciously produced by the speaker. The role that these gestures play in communication is disputed, with some arguing that gesture adds only little information over and above what is already transmitted by speech alone. My own work has provided strong evidence for the alternative view, namely that gestures add substantial information to the comprehension process. One level at which this interaction between gesture and speech takes place seems to be semantics, as indicated by the N400 of the Event Related Potential. I will also present evidence for a syntactic interaction between gesture and speech (as indexed by the P600 component). Finally, I will present evidence suggesting that the left inferior frontal gyrus and left posterior temporal lobe are crucial components of the brain network for co-speech gesture comprehension. These findings are consistent with the idea that these areas play a joint role in gesture-speech integration, with IFG regulating strategic semantic access via top-down signals acting upon temporal storage areas.

SS2.AUD.3 Virtual Reality: A Promising Method for the Study of Multimodal Communication

David Peeters

Tilburg University, the Netherlands

Virtual Reality (VR) technology is increasingly used as a tool for psychological research. In the language sciences, however, its use has long remained virtually non-existent. In this talk, I will argue that immersive VR technology offers unique possibilities to answer fundamental questions about the neurocognitive mechanisms supporting the production and comprehension of multimodal language and communication. More than other methods, immersive VR combines ecological validity, experimental control, and repeatability in experimental settings. Moreover, as a mode of display, it can relatively easily be combined with the collection of EEG, eye tracking, and motion capture data to track online linguistic and communicative processes. I will discuss ongoing work from our lab that shows the added value of VR in the study of i) the interplay between communicative intentions and actions in the production of multimodal deictic speech acts, and ii) the concurrent processing of facial expressions and speech in language comprehension.

SS2.AUD.4 Iconic representations of actions and objects: gestural biases and the emergence of patterns in sign language

Tessa Verhoef

University of Leiden, the Netherlands

The bodily-visual modality affords the ability to iconically represent actions and objects with the movement and shape of the body and hands. In sign languages, related verbs and nouns can be distinguished, for instance, in their manner of movement or iconic handshapes. This talk examines whether nonsigners are sensitive to representational strategies in natural sign languages when pairing gestures with actions or objects, and how these initial biases may drive the emergence of patterns in conventionalized languages. It has been found that sign-naïve gesturers show a strong preference for representing actions with "handling" handshapes, which show how you hold the object, and a slight preference for representing objects with "instrument" handshapes, which show the shape of the object, an encoding strategy that also distinguishes verbs and nouns in ASL (Padden et al., 2015). In ASL, movement patterns also distinguish related verbs and nouns: verbs are formed with longer/continuous movements, while nouns are formed with faster/constrained movements (Supalla & Newport, 1978). Here, we showed 1175 (online) participants pairs of videos of iconic gestures, and asked them to identify each video as representing either an action (e.g. "using a handsaw") or object (e.g. "a handsaw"). When movement is constant across videos and handshape varies, participants tend to map handling handshapes to actions and instrument handshapes to objects. When handshape is constant and movement varies, the expected movement preference is also found. When both handshape and movement vary between the videos, participants weight their handshape preference over the preference based on movement patterns. A second study investigates the interaction between these biases and pressures to systematize and conventionalize in the learnability of artificial languages. Gestural biases, already present in participants who have no experience with sign language, is found to influence the emergence of language-like patterns.

SS2.AUD.5 Future directions for multimodality research

Beata Grzyb

University College London, UK

In the final session of the symposium, we will highlight the importance of multimodal language models across language research, asserting that a multimodal model of language gives a more comprehensive understanding of the mechanisms which underlie language learning and processing. Using some examples of computational models of multimodal behaviours, we will present possible future directions in multimodal language research: i) complex multimodal models, that account for several interacting behaviours, and ii) how language as a multimodal system can shed light on the cognitive systems beyond language. We will also argue that bringing together computer science and developmental psychology/cognitive science permits to combine the best of human learning and the best of machine learning in a way that can benefit both. The results of empirical studies can guide the development of computational models for multimodal learning and processing in socially intelligent artificial agents. Computer science, in turn, can inform developmental psychology by generating explicit and embodied computational hypothesis of how and why different cues combine in language learning and processing.

SS2.CIB

10 Years European Summer School on Computational Modelling of Cognition

Cibeles Room

Chairs:

Klaus Oberauer

University of Zurich

Stephan Lewandowsky

University of Bristol

Casimir Ludwig

University of Bristol

Joachim Vandekerckhove

University of California, Irvine

Robert French

University of Bourgogne

Simon Farrell

University of Western Australia

Lael Schooler

Syracuse University

Gordon D.A. Brown

University of Warwick

Most areas of cognitive science have recognized the enormous power of computational and mathematical models for explaining human behavior and have embraced the rigorous theorizing that modeling permits. This trend comes, however, at a cost: Even established researchers find it difficult to acquire the skills and knowledge required to engage in modeling. The European Summer School on *Computational Modeling of Cognition* seeks to redress this problem by introducing young academics to the basic techniques of computational and mathematical modeling. Over the past 10 years more than 150 young researchers have attended five schools, in part funded by ESCoP. This symposium showcases some of the best work on computational modelling of cognition by alumni of these summer schools.

Speakers:

David Kellen (Summer School 2010)

Alice Mason (Summer School 2012)

Anna-Lena Schubert (Summer School 2014)

Charley Wu (Summer School 2016)

Sophie Scharf (Summer School 2018)

SS2.CIB.1 Testing the foundations of SDT and the general class of threshold models

David Kellen

Syracuse University

Signal Detection Theory (SDT) is one of the most successful and widely used theoretical frameworks in psychology. At the core of SDT is the notion that choices are based on the evaluation of samples taken from distributions established on a latent-strength continuum. It is often assumed that SDT is untestable in its most general form. The present work shows that this untestability notion is incorrect, and that one can actually establish strict tests on SDT using well-known theoretical results from the decision-making literature. These results also provide a way to construct yes-no ROCs without the need for confidence judgments or response-bias manipulations. We conduct these tests in a series of experiments, which include a critical comparison of SDT with the general class of high and low threshold models.

SS2.CIB.2 Assessing the trade-off between memory and online updating in retrospective evaluations

Alice Mason¹, Mark Hurlstone¹, Geoff Ward², Gordon Brown³, & Simon Farrell¹

1. *University of Western Australia*

2. *University of Essex*

3. *University of Warwick*

Retrieving samples from memory is a critical tool for decision-making. We introduce incentive compatible methods to investigate the extent to which memory predicts evaluation. In a series of experiments, we present participants with a sequence of monetary values and ask them to complete both a free-recall task and a willingness to-pay (WTP) task. Using Bayesian hierarchical regression, we predict WTP from both the items that were recalled and those that were presented and discuss how the position of a value in a sequence determines evaluation. Our findings indicate that when participants complete both memory and evaluation tasks there is a cost to memory accuracy, but memory is still an effective strategy for performing evaluation. Participants consistently show better memory for the highest and lowest values in a sequence. We also examined whether an item's location (range and rank) in the distribution of encountered values predicts participant's evaluations, and memory, of sequences.

SS2.CIB.3 Mathematical modeling in cognitive psychometrics

Anna-Lena Schubert¹, Gidon T. Frischkorn^{1,2}, Dirk Hagemann¹, Veronika Lerche¹, Mischa von Krause¹, Andreas Voss¹, Michael D. Nunez³, & Joachim Vandekerckhove³

1. *Heidelberg University, Heidelberg, Germany*

2. *University of Zurich, Zurich, Switzerland*

3. *University of California, Irvine, USA*

The measurement of individual differences in parameters of cognitive processes allows to elaborate and test hypotheses regarding the cognitive processes contributing to individual differences in higher-order cognition. Moreover, it allows identifying cognitive endophenotypes mediating the association between functional brain properties and higherorder cognitive abilities. We will demonstrate how mathematical models of cognition can be used to directly quantify individual differences in specific cognitive processes. In particular, we will present results from two studies in which diffusion models were used to shed light on cognitive processes underlying individual differences in intelligence. In the first study with 125 participants, diffusion modeling was used to reveal domain-specific correlations between drift rates and intelligence. In the second study with 122 participants, we used a model-based cognitive neuroscience approach to reject the

hypothesis that individual differences in the velocity of evidence accumulation mediate the association between neural processing speed and cognitive abilities.

SS2.CIB.4 Navigating Vast Decision Spaces with the Principle of Generalization

Charley Wu

Max-Planck Institute for Human Development, Berlin, Germany

Abstract: How do people explore the vast (and sometimes infinite) decision spaces that define our lives, where the number of possible can never be exhaustively explored? Here the traditional explore-exploit dilemma breaks down, because the question is not “when” but “where” to explore. Using bandit tasks with up to 121 arms, we study how humans search for rewards under limited search horizons, where the spatial correlation of rewards (in both artificial and natural environments) provides traction for generalization. Across 27 different models, we find that Gaussian Process function learning —combined with an optimistic Upper Confidence Bound sampling strategy— provides a robust model for how humans use generalization to guide search. Our modelling results and parameter estimates are recoverable and suggest a systematic — yet sometimes beneficial— tendency towards undergeneralization. These results have been replicated in a number of follow-up studies, where we study risky search, developmental changes in exploration, and search in non-spatial domains.

SS2.CIB.5 Coherence Effects on Information Search: The Influence of Attractiveness Ratings

Sophie Scharf¹, Marc Jekel², Arndt Bröder, & Andreas Glöckner²

1. *University of Mannheim, Germany*

2. *University of Cologne, Germany*

The *integrated coherence-based decision and search* (iCodes) model predicts that information search in multi-attribute decisions is not only influenced by the cues’ validities but also by the attractiveness of the options. In order to clarify the mechanisms of the assumed search process, we manipulated the influence of attractiveness on information search in an experiment by asking half of the participants to rate options’ attractiveness in a half-open mouse lab task. Indeed, rating options’ attractiveness before search increased the tendency to search for the more attractive option. In addition the manipulation affected a parameter representing the relative weight of attractiveness compared to validity in the information search process. The results of this project showed that the attractiveness of the options is an important factor in information search and that the iCodes model is able to capture the individual role of attractiveness in information search in an individually fitted model parameter.

SS2. EST
From Monkey to Man — 100 Years of
Problem Solving Research Since Wolfgang Köhler

Estambul Room

Chair:

Amory H. Danek
Heidelberg University, Germany

In Puerto de la Cruz, Tenerife, Wolfgang Köhler initiated research on insight problem solving with his chimpanzee studies at the anthropoid station of the Prussian Academy of Sciences. Now, 100 years later, the annual ESCoP meeting offers the chance to review the progress made since Köhler's groundbreaking work. This international symposium brings together researchers from Germany, Russia, USA and the UK. Contributions are focused on a modern formulation of the Gestalt theory of structural change (Ohlsson), the neural mechanisms of learning via insight (Kizilirmak), on the dynamics of working memory contributions (Korovkin), on the function of metacognitive triggers in creative design (Ball) and on the tip-of-the-tongue experience (Metcalf). This symposium aims to foster communication between researchers from different countries and disciplines while at the same time honoring the contribution of the founding father of insight research.

Speakers:

Stellan Ohlsson
Jasmin M. Kizilirmak
Sergei Korovkin
Janet Metcalfe
Linden J. Ball

SS2.EST.1 Cognitive structures: What can we say about them a century later?

Stellan Ohlsson

University of Illinois at Chicago, USA

The Gestalt psychologists are known for the hypothesis that the passage from one structure to another, 'better' structure is a principle with great explanatory power and scope, from perception and memory to insight problem solving. Although the American and British discipline of experimental research into cognition recognize their contribution, actual theorizing in this discipline is atomistic and reductionistic in character, assuming that complex cognitive structures are built bottom-up from simpler cognitive structures. In this view of cognition, the structural concept central to Gestalt psychology has no logical place. Meanwhile, developments in evolutionary biology and physics have developed their own formulations of the idea that the completion of a structure is an event of explanatory power. I will review the latter developments to seek a modern, consistent formulation of the Gestalt idea which allows the Gestalters' main conceptual contribution to take its place at the center of contemporary research on cognition.

SS2.EST.2 Learning of novel semantic relationships via sudden comprehension is associated with a hippocampus-independent network

Jasmin M. Kizilirmak, Björn H. Schott, Kristian Folta-Schoofs, & Alan Richardson-Klavehn

Hildesheim University, Germany,

100 years ago, the Gestalt psychologists already proposed that learning via sudden insight during problem solving should facilitate memory encoding compared to more gradual problem solving. Recent studies support this claim by showing behavioral evidence for facilitated long-term memory formation when problems are solved via insight. However, much less is known about the neural mechanisms of learning via insight. This talk will present accumulating evidence showing that learning via insight—or, more generally, sudden comprehension—seems to represent a special case of learning also from a neuroscientific perspective. Insight during problem solving has been repeatedly linked to an activation of the hippocampus. However, although this structure is known to play a crucial role in long-term memory formation, it seems not to be part of the network associated with its encoding benefit. We present fMRI data suggesting that learning via sudden comprehension is mediated by a medial prefrontal cortex dependent network.

SS2.EST.3 Uncovering insight using working memory dynamics

Sergei Korovkin, Ilya Vladimirov, Alexandra Chistopolskaya, & Anna Savinova

Demidov Yaroslavl State University, Russia

We theorize that specific insight mechanisms require varying working memory capacities at different stages of the problem solving process. Our study employed a dual task paradigm to track the dynamics of working memory load during problem solving by measuring the reaction time in a secondary probe-task during the different stages of problem solving. The results indicated that the dynamics of working memory load in insight problems differs from those in non-insight problems. The solution of a non-insight problem is primarily associated with the working memory control system, while insight problems rely on relevant storage systems. Our results confirm that insight requires access to different systems of working memory throughout the solution process. We claim that insight problem solving requires working memory storage during the entire problem solving process and that the control system plays an important role just prior to the solution.

SS2.EST.4 Insight and the Tip-of-the-Tongue experience

Janet Metcalfe

Columbia University, New York, USA

I will explore the similarities in people's experiences of insight problem solving and tip-of-the-tongue resolution. In both cases, at the outset, the answer is unknown but there is a strong premonition that solution is imminent. The feeling state during efforts to solve is unpleasant, and obsessive. There is little/no increase in the feeling of warmth prior to solution. Blockers are frequently experienced, but although they may bear semblance to the answer, the person knows, definitively, that they are wrong. The answer clicks into place suddenly, and the person has high confidence in its correctness. Although the individual may have invested great effort in solving, they do not experience themselves as a causal agent. Instead, in both insight and TOTs, the answer appears to come of its own volition, accompanied by a rush of positive affect and a feeling of grace which may motivate curiosity and drive further quests for understanding.

SS2.EST.5 Uncertainty as a metacognitive trigger for strategy change in complex problem solving

Linden J. Ball

University of Central Lancashire, UK

Real-world domains of human problem solving (e.g., innovative design, scientific discovery and literary accomplishment) are often associated with problems that are illdefined, complex and multi-faceted. Such problems frequently give rise to the experience of high levels of uncertainty by the problem solver given that the way forward is unclear and elusive. Emerging evidence suggests that heightened uncertainty may act as a "metacognitive trigger", promoting changes in productive thinking that can engender successful solutions. I present illustrative examples of such metacognitive cueing of strategy change that arise in the domain of design problem solving. I focus especially on designers' deployment of analogical reasoning and mental simulation as useful strategies that can resolve uncertainty and promote creative insight. I conclude by arguing for the importance of achieving a deeper understanding of metacognitive monitoring and control as key elements of a comprehensive theoretical account of complex problem solving.

SS2.ATE
Peripersonal Space Representation in
Individual and Social Contexts

Atenas Room

Chair:

Yann Coello
University of Lille, France

Peripersonal space (PPS) is a multisensory representation of the environment around the body in relation to the motor system, which underlies interactions with the physical and social world. Although a wealth of studies has highlighted the specific contribution of the body to the representation of peripersonal space, little is known about how the characteristics of the environment and the social context contribute also to the representation of peripersonal space. In this context, the objective of this symposium is to provide new insights into the mechanisms contributing to representing peripersonal space and how this representation influences the processing of physical and social stimuli in the environment.

Speakers:

Tina Iachini
Francesca Frassinetti
Yann Coello
Alessandro Frassinetti
Berenice Valdés-Conroy

SS2.ATE.1 Collision prediction in peripersonal space: The effect of spatio-temporal information and materials of moving objects

Tina Iachini¹, Francesco Ruotolo² & Gennaro Ruggiero¹

1. *University of Campania "Luigi Vanvitelli"*

2. *University of Lille, Nord de France*

Being able to predict collisions is a fundamental survival prerequisite for all moving species, especially when events occur near organisms. Here we explore whether the peripersonal (near) and extrapersonal (far) distance between our body and the moving objects affects the capacity to predict collisions. In two experiments we manipulated velocity and trajectory of two balls moving towards each other in the fronto-parallel plane at a peripersonal/extrapersonal distance in such a way as to collide or not. In a third experiment we manipulated the materials from which the balls were made: glass vs gum. The results showed a lower discrimination capacity and more false alarms when the moving balls had different velocity in peripersonal rather than extrapersonal space. This tendency to erroneously predict collisions was higher with glass than rubber balls in peripersonal space. The possible link between the anticipatory safety function of peripersonal space and collision prediction is discussed.

SS2.ATE.2 Time in the reachable space: Tool-use effect on time processing in right brain damaged patients

Francesca Frassinetti^{1,2}, Stefano Avanzi² & Michela Candini¹

1. *University of Bologna, Bologna, Italy.*

2. *Fondazione Salvatore Maugeri Hospital IRCCS, Mantova, Italy*

Considering the link between time and spatial representation based on action potentiality, we have investigated if right brain damage (RBD) patients with a spatial attentional deficit involving selectively reachable or unreachable space, show a temporal deficit in the affected portion of space and if such dissociation disappears after tool-use training, inducing a remapping of unreachable as reachable space. Healthy participants and RBD patients performed a Landmark task and Time Bisection task. Stimuli were horizontal lines of different durations, bisected by a transector at different spatial positions. Participants judged which end of the line, left or right, the transector was closer to (Landmark task) and the stimulus duration (Time Bisection task). Participants performed both tasks, in reachable and unreachable space, before and after a tool-use training. Results highlight the role of the right hemisphere in time representation accordingly with action potentialities of space and the plasticity of such a representation.

SS2.ATE.3 The representation of peripersonal space depends on the outcome of executed and observed motor actions

Maria Francesca Gigliotti¹, Patricia Soares Coelho^{1,2}, Joana Coutinho² & Yann Coello¹

1. *University of Lille, CNRS, UMR 9193 - SCALab - Lille, France.*

2. *University of Minho, Braga, Portugal.*

Peripersonal space (PPS) is a multisensory representation of the environment around the body in relation to the motor system, underlying the interactions with the physical and social world. Little is known however about how intrinsic objects value in social contexts influences the representation of PPS. In a series of experiments, we tested the effect of modifying the spatial distribution of reward yielding targets on a manual target selection task and peripersonal space representation. We found that when performing a target selection task in a social cooperation context, individuals prioritized targets located in their proximal space, avoiding invading others' PPS. Despite the reduction of the individual workspaces, the target selection task induced an expansion of PPS

representation, which was not observed when participants performed the task alone, or in the presence of a passive confederate. The effect was even more pronounced in the presence of a biased distribution of reward-yielding target towards one of the confederates. We conclude that reward-dependent modulation of objects values in the environment modifies the representation of peripersonal space, when resulting from either self-generated motor actions or observation of motor actions performed by a confederate.

SS2.ATE.4 Social dimension of peripersonal space

Fadila Hadj-Bouziane, Audrey Dureux, Elvio Blini, Laura Grandi, Claudio Brozzoli & Alessandro Farnè
Lyon Neuroscience Research Center - ImpAct Team, France

Living in our social world requires flexible adjustments of the distances to maintain with respect to others. Such adjustments are tightly linked to our perceptual discriminative abilities that could be affected depending on the distance from the perceiver. We will present findings aimed at better understanding how social information modulates discrimination abilities in different regions of space. Our results show that participants are faster to discriminate males from female faces when they are presented at closer distances, even when farther faces appeared bigger than closer ones. Thus, the recently reported improvement in perceptual processing for PPS stimuli (Blini et al., 2018) extends to social stimuli. Modelling the spatial distribution of face discrimination abilities in depth, together with the effect of distance and emotional valence on physiological measures and personality traits, will help clarify the influence of social information on the processing of stimuli in the PPS.

SS2.ATE.5 Brain activation correlates during the visual processing of threat in individual and social space

Berenice Valdés-Conroy
Universidad Complutense de Madrid, Spain

This research was completed to study the influence of social context during the visual processing of objects in near (peripersonal) and far (extrapersonal) space. Threatening and non-threatening pictures of objects were presented at nine different positions displayed on a 52" inch-long screen placed orthogonally to participants' location. The electrical brain response was measured while participants indicated whether the objects were near enough to be reached or not (reaching distance estimation task). In one block of trials, participants performed the task alone while in another block the experimenter sat at the opposite side of the digital surface. The analyses of behavioral responses replicated previous effects with faster responses to objects presented in Near-space. Additionally, a 3-way significant interaction (Location x Threat x Social Context) showed that when performing the task in individual context, affective properties of objects modulated the speed of response in Near-space but not in Far-space. Response to threatening objects was significantly faster than to nonthreatening objects. However, when the experimenter was located at the opposite side of screen (Social context) the same effect of threat was observed but this time in Far-space (*Near the other*). Event Related Analyses of the electrical brain response (ERPs) replicated also main effects in a negative component around 100ms after stimulus onset (N1) observed over occipital regions and that is frequently associated to early visual processing. Consistent with previous evidence, N1 showed significantly faster latencies and greater amplitudes for objects presented in Near-space. This effect has been previously interpreted as evidence in support for a vision-for-action type of processing within the dorsal visual stream. Significant modulations from social context and threat interaction were observed at later stages of processing between 300 and 600 ms with different temporal and topographical distributions for Near and Far space. In sum, the results provide new evidence about the effect of social variables in the representation of egocentric space and the space of others. We discussed these findings from an embodied cognition perspective focusing on its possible implications in the mechanisms involved in the empathic response.

SS2.StT

The Psychology of Human Habits

Saint Tropez Room

Chair:

David Luque
Universidad Autónoma de Madrid

Goal-directed and habit systems shape reward-related learning and decision making. Animal research has been very successful at unveiling the neuro-cognitive processes underlying the operation of these two systems and their possible interactions. Recent years have seen a continuing surge of interest in human habitual behavior from basic and neuroscientific research, also from applied and clinical contexts. This recent work has offered very promising outcomes, but many questions remain unsolved and critic voices have arisen to point out methodological shortcomings and important theoretical gaps. This symposium includes papers that represent critics to the state-of-the-art, and also innovative approaches to the study of human habit system. These presentations also cover the study of individual differences in the balance between goal-directed and habit systems. Together these presentations will represent a very-needed step forward in human habit research. Discussion will help to build the conceptual and theoretical basis for the future of the field.

Speakers:

Jan De Houwer
Sanne de Wit
Gonzalo P. Urcelay
Felisa González
Pedro L. Cobos

SS2.StT.1 Why habit research is a mess

Jan De Houwer

Ghent University, Belgium

Research on habits suffers from conceptual, methodological, and theoretical problems. At the conceptual level, different people use the term “habit” in different ways. Different definitions do not overlap, which often leads to misunderstandings between people who use the term in different ways. At the methodological level, it is difficult to establish that a behavior meets the criteria of a habit (e.g., that it is automatic or not a function of its consequences). Moreover, virtually all habit research includes a confound between the frequency and recency of behavior. At the theoretical level, habit research remains dependent on simplistic S-R association formation theories that are known to be grossly inadequate for explaining learning in humans. I explore potential solutions for each of these problems.

SS2.StT.2 Neural Correlates of the Ability to Form a Real-World Routine – a Diffusion Tensor Imaging investigation

Sanne de Wit

University of Amsterdam

Even small changes in daily routines can have major health benefits, and it is important, therefore, to gain insight into why some people succeed in changing their behavior while others fail. To this end, 77 healthy, young volunteers underwent magnetic resonance imaging with diffusion tensor imaging, and subsequently formed the real-world routine of taking a (placebo) pill daily during three consecutive weeks. We show that their ability to form this routine was related to individual differences in white-matter connectivity between striatal and prefrontal regions that have been proposed to support prospective memory and executive function. We also investigated the subjective automatization of pill intake, and found that this correlated negatively with corticostriatal tracts that have previously been implicated in flexible, goal-directed action. Furthermore, we related pill intake and subjective automatization to individual differences in conscientiousness, lifestyle regularity, and vulnerability to ‘slips of action’ as measured with a computerized task.

SS2.StT.3 Delayed rewards promote habits

Gonzalo P. Urcelay¹, Selina Chadha¹, Sietse Jonkman², Anushka Fernando³ & Omar D.C.

1. *University of Leicester, UK*

2. *The Boston Consulting Group, US*

3. *University College London, UK*

4. *California Institute of Technology, US.*

Instrumental behaviour can be goal-directed or habitual, depending on amount of training, schedules of reinforcement, and the use of choice procedures. We will present data from rodents and humans suggesting that another factor, a delay between action and outcome, can facilitate habit formation. We trained rats to lever-press for pellets presented immediately or 20 sec later. Following outcome devaluation, we observed devaluation with immediate rather than delayed rewards. In humans, we developed a task in which participants purchased shares of different companies, with the feedback of each action presented immediately after a purchase, or 5 sec later. We then revalued the companies by informing participants that the company had crashed (or was doing better). We observed significant revaluation with immediate outcomes, but not when these were delayed. Because human actions are most often than not followed by delayed consequences, these results have important implications for human cognition.

SS2.StT.4 Individual differences in the effect of outcome devaluation on action control and selection: the role of emotional impulsiveness

Felisa González & Irene Hinojosa

University of Granada, Spain

Adaptive control of behavior and action selection requires updating the predicted incentive value of the outcome. The effectiveness of this flexible change in its representation of and its integration with action-outcome learning may be estimated through the outcome devaluation procedure. The effect of CS+ on action selection may also be assessed through the interaction between cue-outcome and action-outcome learning, by means of the Pavlovian-to-Instrumental transfer effect. Currently, there is an ongoing debate about whether the outcome-specific PIT effect is based more on the activity of the habit system than on the goal-directed one. Discrepancy in results has been usually explained appealing to procedural differences that may encourage participants to use a more cognitive strategy. We suggest that, using the same task, action control selection may be controlled more by the habitual or the goal-directed action systems depending on individual differences that have been linked to failures in automatic-implicit emotion regulation.

SS2.StT.5 Exploring the relationship between avoidance habit acquisition and intolerance of uncertainty

Pedro L. Cobos

University of Málaga, Spain

In our laboratory, we have explored the relationship between individual differences in avoidance habit acquisition and intolerance of uncertainty in healthy population. One of our results is that scoring high in intolerance of uncertainty is positively related to insensitivity to the devaluation of outcome aversiveness. This relationship remained significant even when controlling for trait anxiety. Of note, we did not find any relationship between intolerance of uncertainty and insensitivity to outcome aversiveness in a control group who received avoidance training with two aversive outcomes of different intensities during the whole training process. Although these results do not necessarily speak by themselves of a relationship between intolerance of uncertainty and avoidance habit acquisition, they suggest that high intolerant individuals may be more vulnerable to acquiring avoidance habits in the long term.

SS2.TAR**The Multifaceted Manifestations of Autobiographical Memory:
From Severely Deficient to Highly Superior Performance, Passing Through Normal Functioning*****Tarraco Room***

Chairs:

Valerio Santangelo
University of Perugia, Italy

Daniela J. Palombo
University of British Columbia, Canada

Remembering one's own past is a core human ability, typically referred to as autobiographical memory (AM). Cognitive processes and brain systems underlying AM have been classically investigated either by studying normal functioning in neurotypical subjects or impaired functioning in patients with neurological or psychiatric deficits. Recent lines of research offer, instead, the opportunity to investigate AM in extremely rare individuals that showed either severely deficient autobiographical memory (SDAM) – in absence of any brain impairment – or highly superior autobiographical memory (HSAM). This symposium will take inspiration from these recent findings to highlight the multifaceted conditions of individual differences in AM, ranging from those observed in neurotypical populations, moving to impaired AM in pathological conditions, to conditions of selective enhanced (HSAM) or selective deficient (SDAM) AM performance. The integration among these findings may provide important insights into the cognitive and neurobiological mechanisms underlying individual differences in AM.

Speakers:

Marco Sperduti
Pascale Piolino
Valerio Santangelo
Daniela J. Palombo
Signy Sheldon

SS2.TAR.1 Presence is associated to memory formation for naturalistic material

Marco Sperduti, Dominique Makowski, & Pascale Piolino

Université Paris Descartes

Presence is commonly defined as the feeling of “being there”, i.e. the feeling of being located in, and responding to a mediated environment as if it were real. Originally introduced in the virtual reality domain, its definition has been extended to other media format (e.g., films, books), with some authors suggesting that presence in mediated worlds does not fundamentally differ from presence in the real one. The pillar of presence is the attentional and emotional engagement toward the present experience, two factors known to play a pivotal role in memory formation. Across two ecological studies on large samples (study 1 = 244 and study 2 = 1407 participants), we showed that presence while watching a movie was positively related with memory for details of the movie. Presence was modulated by the reported self-relevance of the movie, the emotional reactivity toward it, and by inter-individual differences in interoceptive sensitivity. Our findings suggest that presence could be a key mechanism in explaining the encoding of events in memory. Moreover, they could shed light on the cognitive processes underlying memory impairments in psychiatric conditions characterized by an altered sense of reality.

SS2.TAR.2 The interplay between autobiographical memory and temporality: Experimental and neuropsychological evidences

Pascale Piolino & Valentina La Corte

Université Paris Descartes

The study of autobiographical memory processes has been expanded to encompass the processes involved in the foresight of personal events in the future dimension and has revealed the crucial role in adaptive and social behaviors and well-being. Given the fact that objectively the perspective of future time reduces as time passes and people get older, this issue is particularly important in aging. We will present a series of evidence on healthy aging, Alzheimer's disease and semantic dementia investigating the neurocognitive mechanisms of the individuals' capacity to travel abroad time taking into account all episodic and semantic components. Our take home message is that the semantic representation of past and future increases with the projection distance.

SS2.TAR.3 Enhanced brain activity in highly superior autobiographical memory

Valerio Santangelo

University of Perugia

The recent discovery of rare individuals with highly superior autobiographical memory (HSAM) provides the opportunity to investigate the neural correlates of enhanced memory. Here we asked a group of HSAM and control subjects to retrieve autobiographical memories (AMs) as well as non-AMs (i.e., semantic memory; e.g., examples of animals) during fMRI scanning. Subjects were instructed to signal the “access” to an AM by a key press and to continue “reliving” it immediately after. Compared with controls, individuals with HSAM provided a richer AM recollection and were faster in accessing AMs. In HSAM subjects, the access to AMs was associated with enhanced prefrontal/hippocampal and temporoparietal/sensory cortex functional connectivity. In contrast, HSAM and control subjects did not differ in functional activity during the reliving phase. These findings suggest that enhanced activity of these regions is selectively involved in enabling more efficient access to past experiences in HSAM.

SS2.TAR.4 Severely deficient autobiographical memory: Behavioural and neural substrates

Daniela J. Palombo

University of British Columbia

Although humans have the capacity to re-experience specific events from the past, emerging research suggests that there are robust individual differences in the capacity to do so. Indeed, the study of individual differences in autobiographical memory has been brought into the spotlight by the dramatic descriptions of syndromes such as severely deficient autobiographical memory (SDAM) – which refers to individuals who cannot recollect autobiographical experiences but are otherwise healthy. In my talk, I will synthesize what is currently known about SDAM, including patterns of reduced performance on laboratory and autobiographical memory measures, as well as reduced engagement of the canonical autobiographical memory network, as measure through multiple imaging modalities. I will end my talk with a broad discussion of new directions for targeting mechanisms of SDAM. Moreover, I will reflect on how the study of individual differences, both in extreme and non-extreme forms, may inform theoretical models of human memory.

SS2.TAR.5 Neural and behavioural substrates of individual differences in autobiographical remembering

Signy Sheldon

McGill University

A recent proposal considers autobiographical remembering as a trait, reflecting a relatively stable preference in how an individual access their personal past. We tested whether a preference in using an episodic (experiential) versus semantic (fact-based) method of remembering is reflected in the neural and cognitive mechanisms of autobiographical memory. Using fMRI, we found that differences in episodic versus semantic remembering were reflected in intrinsic medial temporal lobe (MTL) functional connectivity patterns. Episodic versus semantic remembering also related to representational differences between anterior and posterior segments of the hippocampus. Next, we used behavioral experiments to test the hypothesis that engaging in episodic remembering is related to the ability to activate imagery-related component processes of autobiographical memory. Together, these studies suggest that the ability to dynamic recruit the autobiographical neurocognitive system, likely directed by the hippocampus and other MTL structures, can account for trait differences in how individuals remember.

SS2.BAR
On the Interplay Between Orthographic and Motor Processes
During Word Writing

Barcelona Room

Chairs:

Olivia Afonso
Oxford Brookes University

Carlos J. Álvarez
Universidad de La Laguna

During decades, written production was investigated either as a linguistic or as a motor task. However, the expansion of research methods for the analysis of chronometric measures of writing has revealed that higher-order processes involved in the retrieval and maintenance of the orthographic representations and processes involved in the execution of the motor response interact in a complex manner. The proposed symposium will include five talks contributing to the understanding of this interaction. Studies presented in the symposium will address how the interplay between orthographic and motor processes changes as a function of age and writing skill, and also how it is affected by atypical literacy development. Moreover, evidence regarding the neural correlates of this interaction will be provided. Presentations will address the effect on handwriting kinematics of a range of orthographic processes, such as the application of phoneme-to-grapheme correspondences, lexical access or letter order coding.

Speakers:

Olivia Afonso
Eric Lambert
Marieke Longcamp
Guido Nottbusch
Paz Suárez-Coalla

SS2.BAR.1 Repetition facilitation and repetition inhibition effects in handwriting kinematics: What do they tell us about letter position coding?

Olivia Afonso

Oxford Brookes University

In this study we investigate how letter identity and position are coded in orthographic representations by exploring the effects of repetition facilitation and repetition inhibition, classically obtained in serial recall research, during word writing. In Experiment 1, participants copied words including the same letter in a massed repetition (BIZARRE), a non- adjacent repetition (PROVERB) or in a non-repetition context (VAMPIRE). Results revealed that inter-letter intervals and letter durations were consistent with the pattern of facilitation and inhibition usually reported in serial recall tasks. Interestingly, results also showed that in non-adjacent repetitions the first repetition of a letter was slower than in a non-repetition control, revealing a distinctive inhibition effect due to letter anticipation in handwriting. Experiment 2 (analyses ongoing) tested whether these effects varied when repetition affected the last letter of words, as it would be predicted by models proposing that last letters act as anchors for letter position coding.

SS2.BAR.2 The role of handwriting and fine motor skills in adults' orthographic learning

Eric Lambert & Margaux Lê

Université de Poitiers

Many studies have focused on how children learn to spell new words. They have shown that phonological skills are an important factor. But other cognitive skills are related to orthography acquisition such as visual processing or handwriting processing. The role of handwriting could come from motor information. However, few studies have investigated this issue in adults, which we have done here, and, we studied the motor skills as mechanisms underlying the role of handwriting. During the learning phase, forty-five French undergraduates had to either orally spell out pseudowords or handwrite them. During the test phase, participants performed a copy-to-dictation task. Participants were also tested on their fine motor and graphomotor skills. The results showed that the spelling of pseudowords was better recalled if the items were learned using a handwriting task rather than a spelling-aloud task. The importance of handwriting in adult spelling acquisition may come from fine motor skills.

SS2.BAR.3 On the relationship between orthographic and motor levels of processing in writing to dictation: evidence from brain imaging and kinematic recordings

Marieke Longcamp

CNRS and Aix-Marseille Université

In handwriting, the dissociation of orthographic and motor processes and their neural substrates is an established fact, but the nature of the relationship between the two is debated. I will present data two experiments where we manipulated the presence and the position of inconsistent phoneme-to-grapheme mappings in words in a writing to dictation task. In the first experiment we coupled kinematic and functional MRI recordings. In the second experiment we recorded writing kinematics only and performed an extensive analysis of several indexes. Our results generally support a continuous and interactive view of the relationship between orthographic and motor levels of processing. I will discuss possible mechanisms within the spelling system and between the spelling and motor systems. Despite this, some fine-grained behavioral effects remain incompatible with either the discrete or the interactive accounts. I will argue that they may be explained by the intervention of extra mechanisms, such as monitoring.

SS2.BAR.4 Pause locations in writing orthographically awkward words

Guido Nottbusch

University of Potsdam

According to current models of handwriting, delays caused by higher cognitive processes (such as access to spellings) should arise several movements before the production of the actual tricky character(s) because of incremental processing. However, during handwriting children usually show delays right at the orthographic problem. This may be a specific feature of developmentally unskilled spelling. For this study, skilled adults wrote orthographically awkward words (low frequency words with opaque phoneme-grapheme- correspondences) to dictation. The same words were afterwards copied several times for control. All the stimuli consisted of nouns containing one opaque phoneme appearing earliest at the fourth letter (e.g. "Amalgam"). Writing movements were recorded by means of a digitizing tablet. Hesitating, pauses and non-automated writing movements were found word- initially as well as word-internally before and right at the opaque phonemes with the pen on paper as well as during in-air movements. Differences between beginning and skilled writers will be discussed.

SS2.BAR.5 Handwriting production in children with dyslexia: spelling or motor difficultiesPaz Suárez-Coalla¹, Cristina Martínez-García¹, Fernando Cuetos¹, & Olivia Afonso²1. *University of Oviedo, Spain*2. *Oxford Brookes University*

Recent studies stated that spelling ability influence handwriting production. But it is also reported that children with dyslexia have slow handwriting because of poor motor skills. In this study we examine the impact of lexicality and length in handwriting production of children with dyslexia, and the possible relationship with motor ability. Twenty-one children with dyslexia (10-12 years) were compared to both age matched and literacy-ability matched children (8-9 years). Participants completed a spelling-to-dictation task of consistent-high- frequency words and pseudowords, where length was manipulated, and a drawing trails task. Results showed that children with dyslexia produced longer latencies and writing durations than both age and literacy-ability matched children. In addition, they were more affected on writing duration by length and lexicality than children without dyslexia, indicating they could present a deficit in the automation of the orthographic code. Finally, some children with dyslexia showed similar motor skills to literacy-ability matched children.

SS2.PAL

Emotional Conflict - Cognitive Conflict

Palma de Mallorca Room

Chairs:

Renata Cserjési
Alexander Logemann
Eötvös Loránd University, Budapest, Hungary,

Cognitive control is essential for everyday functioning, especially in response to emotional and/or cognitive conflict situations, and deficits of cognitive control can have marked consequences. More specifically, cognitive control and flexibility is known to be affected by affective processes and Body Mass Index as well as environmental factors such as context, and perceived (goal) conflict. However, to the best of our knowledge, there is still substantial ambiguity regarding to how these factors interact and affect cognitive control. This ambiguity is addressed in the current symposium. In addition, the complex relation between emotional processes, emotional conflict and cognitive conflict with respect to behaviour will be addressed.

Speakers:

Wim Notebaert
Adam Perkins
Artyom Zinchenko
Renata Cserjési
Alexander Logemann

SS2.PAL.1 The affective twitches of task switches

Wim Notebaert

Ghent University, Belgium

Task switching refers to the demanding cognitive control process that allows us to flexibly switch between different task contexts. It is a seminal observation that task switching comes with a performance cost (i.e., switch cost), but recent theories suggest that task switching could also carry an affective cost. In two experiments, we investigated the affective evaluation of task switching by having participants perform a task-switching paradigm followed by an affective priming procedure. Crucially, the transition cues of the task-switching paradigm, indicating task alternations or task repetitions, were used as primes in the affective priming procedure to assess their affective connotation. We found that task alternation primes were evaluated as more negative than task repetition primes. These findings show that task switching is affectively tagged, and suggest a potential role for emotion regulation processes in cognitive control.

SS2.PAL.2 Anxiety, threat and goal conflict

Adam Perkins

King's College London, UK

Anxiety is a cognitive state that experimentally linked to goal conflict, yet in rodents it is also linked to threat by the finding that anti-anxiety drugs modulate innate reactions to potential threats. In a series of studies, I have tested this link in humans using tasks that expose participants to various forms of threat. Results support the notion that anxiety is elicited by both goal conflict and threat as the anti-anxiety drug lorazepam modulates reactions to both physical and abstract threats. Using the Joystick Operated Runway Task I found that lorazepam altered the intensity of threat avoidance behavior for simple threats that can be simply avoided as well as threats that entail approach (i.e., goal conflict). Using the moral dilemma questionnaire I found that lorazepam increased the probability of selecting responses that entail inflicting direct physical harm on other people. Overall, results suggest anxiety represents a broad reaction to challenging situations, whether threatening or entailing goal conflict.

SS2.PAL.3 Affective modulation of conflict processing across the lifespan

Artyom Zinchenko

Ludwigs-Maximilians-Universität, Munchen, Germany

Cognitive control supports goal-directed behavior by resolving conflict among opposing action tendencies. In the present work we investigate the role of affective information in the modulation of executive control across the lifespan. Specifically, we investigate how task-relevant and -irrelevant emotions modulate cognitive control and response inhibition in children (5-7 years old), younger and older adults (26-67 years old) using multisensory face-Stroop and Go/Nogo tasks and EEG methodology. Finally, we attempt to identify specific mechanisms and stages of information processing that are modulated by emotional information by means of diffusion modeling.

SS2.PAL.4 Cannot see the wood for the trees. Measuring emotional conflict with a newly developed task**Renata Cserjési***Eötvös Loránd University, Budapest, Hungary*

To measure emotional conflict our lab developed a new task, the emotion shifting task. The task aims to assess the speed and accuracy of shifting between opposite emotional valences. It consists of carefully selected pair of pictures displayed one by one on a screen. In each pair the first picture represents a part of the second picture, whilst the second picture is the whole one. Shifting happens when the valence of the first picture is different that of the second one. To assess the psychophysiological correlates of conflict, we registered electrodermal activation and heart-rate variability during task performance in healthy adult participants. Furthermore, we used mouse tracking paradigm to detect conflict between outcoming responses.

SS2.PAL.5 Inhibitory control in contexts that differ in terms of anticipated reward**Alexander Logemann¹, Afework Tsegaye¹, Cuiling Guo¹, Gijsbert Stoet², Renata Cserjési¹, & Gyöngyi Kökönyei^{1,3}****1. Eötvös Loránd University, Budapest, Hungary****2. University of Essex, UK****3. Semmelweis University, Hungary**

Inhibitory control is crucial for normal functioning, and poor inhibitory control is key to negative health consequences and conditions. Some studies have suggested that inhibitory control may fail in contexts of specific anticipated rewards (i.e. palatable food), depending on the subject state (stress, body mass index). However, there is substantial ambiguity regarding the specificity of this effect, and the role of plausible factors that may moderate this effect. In our online study, participants performed a go/no-go task with three conditions that differed in terms of reward context. In the neutral condition, go/no-go pictures were solid-color squares, in the general reward context pictures represented money and in the specific reward condition, the pictures represented palatable food. Preliminary results did not support the hypothesis that the effect of condition with respect to inhibitory performance varies as a function of BMI. Secondary results and plausible interpretations will be discussed in detail.

SYMPOSIUM SESSION 3

Friday 27th

15:40-17:20

SS3.AUD

Recent Advances in Cognitive Control Research

Auditorio

Chairs:

Evie Vergauwe
Université de Genève
Senne Braem
Vrije Universiteit Brussel

Cognitive control refers to the higher-order processes that allow for goal-directed and adaptive behavior. Traditional theories mostly understand cognitive control as originating from a set of supervisory, independent, executive control systems, which are often seen as diametrically opposed to low-level learning processes. Similarly, cognitive control is traditionally studied in isolation from other mental concepts, like emotion or social cognition. In this symposium, however, we bring together different speakers that deviate from these traditional definitions and research lines, by taking into account factors such as the need for instructions, its relation to emotion, its role in social cognition, or its sensitivity to contextual features in our environment. In doing so, they provide new insights into the underlying processes and neural mechanisms of cognitive control.

Speakers:

Noga Cohen
Baptist Liefoghe
David Dignath
Yu-Chin Chiu
Richard Ridderinkhof

SS3.AUD.1 Cognitive control training enhances emotion regulation

Noga Cohen

University of Haifa

Adaptive behavior depends on the ability to effectively regulate emotional responses. Failure in the regulation of emotional arousal can result in heightened physiological reactions and disruptive behavioral performance. In turn, these behavioral and physiological alternations can lead to various psychopathologies. In several studies we demonstrated that training cognitive control, an attentional mechanism that enables goal-directed behavior, lead to reduced emotional interference by aversive pictures. This training was also associated with a reduction in amygdala activation to aversive pictures and with an increase in amygdala-prefrontal connectivity. Moreover, we showed that training individuals to recruit cognitive control prior to the presentation of unpleasant pictures enhances their ability to regulate an upsetting personal event using reappraisal. These findings suggest that the interplay between emotion and cognitive control is essential for maintaining adaptive behavior and may be impaired in individuals with emotion regulation deficits.

SS3.AUD.2 On the demystification of instructions as the source of cognitive control: Where do we stand?

Baptist Liefoghe

Universiteit Gent

The ability to share and use verbal instructions is thought to separate humans from other animal species. Using language, we can bypass trial-and-error learning and verbal instructions are omnipresent both in daily life as well as in psychological research. Many accounts consider instructions as the mythical source of cognitive control. However, the mechanisms via which instructions set-up cognitive control are still poorly understood. These mechanisms have gained prominence in research focusing on automatic effects of new instructions that were never overtly practiced before. Following a quick tour of the current status of this research, a critical analysis is presented of the many theoretical gaps that still need to be filled in. The thesis is defended that a narrow focus on automatic effects of instructions may be detrimental when trying to understand how instructions control cognitive control.

SS3.AUD.3 Binding of control-states into event-files

David Dignath

Albert-Ludwigs-Universität, Freiburg

How do we manage to shield our goals against distraction? Traditionally, this ability has been attributed to top-down cognitive control, which is assumed to monitor for, and intervene in case of response conflicts. However, this account has been challenged by episodic-retrieval views, which attribute sequential modulations of conflict effects to bottom-up memory for stimulus and response features. In this talk, I will present evidence suggesting that control and retrieval accounts are no alternatives but, rather, two sides of the same coin. Following recent theorizing, I will argue that control parameter can become stored in event files, together with stimulus, response, and context codes, so that cognitive control operations, independently from the stimulus-response codes the operate on, can come under mnemonic control. As a consequence, memory aids control operations by automatizing and tailoring them to the situational circumstances.

SS3.AUD.4 Stimulus-control learning in task switching

Yu-Chin Chiu

Purdue University

Cognitive control is a top-down process that overcomes automatic response tendencies primed by the environmental stimuli. Recent empirical evidence suggests that interference control can be instantiated automatically by stimuli in a bottom-up manner based on prior associations between the stimulus and a particular control state. We (Chiu & Enger, 2017) further tested this learning hypothesis with the control processes mediating task switching. We found that items that are frequently associated with switching incur a smaller switch cost than items associated with a low probability of switching, i.e., an item-specific switch probability (ISSP) effect. However, whether ISSP learning also influences people's voluntary choice to switch task remains unknown. To address this question, we combined an ISSP manipulation and a hybrid protocol with 75% cued switch trials and 25% voluntary switch trials, allowing us to assess the effect of ISSP on both switch costs and voluntary switch rate (VSR). We observed robust ISSP effects on cued trials as well as a greater VSR for items associated with a high than a low switch probability. Our results thus show that ISSP learning not only improves the efficiency of switching but also increase people's willingness to switch voluntarily.

SS3.AUD.5 Predictive processing and cognitive control in action: The case of inferring action intentions

Richard Ridderinkhof

Universiteit van Amsterdam

Cognitive control in action rests on the ability to (learn to) adequately predict the consequences of actions. Predictive processing theories assume that inferring another's action intentions requires a forward model of that agent's action, which can be obtained through learning by simulation. Based on this notion, we ran a series of studies on goalkeepers in soccer and handball, who try to infer the intended direction of a penalty being kicked or thrown at them. We've run behavioral training studies, an fmri-mvpa study, and currently an eeg-mvpa study to grasp the mechanisms underlying the ability to predict (i.e., inverse model the sensory consequences of) penalty's. Results suggest that goalkeepers do engage in motor imagery to infer action intentions of penalty kickers/throwers, and use the ensuing predictions to make successful saves.

SS3.CIB

Language Learning as a Byproduct of Communication

Cibeles Room

Chair:

Marc Brysbaert
Ghent University

Recent years have seen a multitude of studies investigating the learning of new word forms and the role of sleep in the process. Most studies involve explicit teaching of the stimulus materials. However, it is well documented that much language acquisition happens outside formal contexts as a byproduct of everyday communication. Such learning is called incidental learning or contextual learning (because incidental learning stresses non-intentionality too much). It is involved in learning both the native language (L1) and new languages (L2). The present symposium presents the latest evidence about the role of non-formal learning in various aspects of language acquisition. It involves five talks.

Speakers:

Vanessa De Wilde
Kate Nation
Anne Castles
Anna Weighall
Irina Elgort

SS3.CIB.1 L2 learning through out-of-school exposure

Vanessa De Wilde^{1,2}, Marc Brysbaert¹ & June Eyckmans¹

1. *Ghent University*

2. *Artevelde University College Ghent*

Today's omnipresence of English in European countries provides an excellent context to investigate L2 learning in an informal setting. This presentation will look into children's learning of English through out-of-school exposure before the start of English classroom instruction. In a study targeting Dutch-speaking eleven-year-olds in Flanders, 780 children took a receptive vocabulary test and an English proficiency test (measuring listening, reading, writing and speaking skills). By means of a questionnaire factors such as the amount of exposure to English through different media, the amount of contact with speakers of English and the contexts in which English is used, were also gauged. The results show large language gains for a substantial number of children but also point to a broad range in obtained test scores. The most beneficial types of input are gaming, computer use and contact with speakers of English. These input types are multimodal, interactive and involve production.

SS3.CIB.2 Children's learning of new words via incidental reading of stories containing morphologically-complex or morphologically-simple words

Kate Nation

University of Oxford

To investigate word learning from non-instructed reading experience, 76 10-year-olds encountered 20 unfamiliar words five times across a series of short (100 word) stories. Half of the words were seen in a morphologically-complex condition (e.g., allude, alluded, alluding, allusion) and half in a morphologically-simple condition (stem only). Knowledge of form (orthographic choice) and meaning (definition and morphological knowledge in new context) were assessed, along with the children's morphological awareness. Children learned orthographic form equally well, regardless of morphological complexity during reading experience. The extent of morphological learning interacted with the child's own morphological awareness and exposure condition. In the complex condition, low awareness children showed a greater morphological learning benefit whereas in the simple condition, those with the highest level of awareness showed a learning benefit. Incidental word learning via reading depends on the type of knowledge assessed, the nature of exposure and the child's existing knowledge and skills.

SS3.CIB.3 Orthographic skeletons: Contextual learning of orthographic form prior to printed word exposure

Anne Castles¹, Signy Wegener¹, Hua-Chen Wang¹, & Kate Nation²

1. *Macquarie University, NSW, Australia*

2. *University of Oxford, United Kingdom*

When children are familiar with a word in oral form and know phoneme-to-grapheme mappings, they appear form an expectation about that word's likely spelling even before seeing it in print, and without explicit instruction (Wegener et al., 2018). Here, we asked whether these "orthographic skeletons" are built around a word's consonants, vowel, or both? Forty-one Grade 4 children received oral vocabulary training on one set of novel words (e.g. "desh", "taff", "jorv") while another set were untrained. Spellings were either predictable from their phonology (e.g. desh), or included an unpredictable consonant (e.g. taph) or vowel (e.g. jauv). Trained and untrained items were shown in print for the first time, embedded in sentences, and children's eye movements were monitored. Trained items with predictable spellings were consistently fixated

for shorter periods than untrained predictable spellings. Early processing measures (first fixation and gaze duration) showed that this benefit of oral training for predictable spellings was significantly larger than for unpredictable consonant and unpredictable vowel spellings. Late in processing (total reading time), this pattern persisted only for unpredictable consonants. These results suggest that orthographic skeletons involve both consonants and vowels initially; with unpredictable vowel spellings being more rapidly resolved online than unpredictable consonant spellings. More broadly, the results point to the extensive contextual learning about orthography that occurs in school-age children even before seeing individual words in print.

SS3.CIB.4 The Matthew Effect in word learning for children speaking English as an additional language. Can the poor get richer?

Anna Weighall¹, Emily Oxley² & Hannah Nash²

1. *University of Sheffield, UK*

2. *University of Leeds, UK*

Evidence is mixed as to whether speaking more than one language confers a language learning advantage, especially for children who enter UK schools speaking English as an additional language (EAL) with a significantly smaller English vocabulary (Murphy, 2014). Phonological aspects of word learning have been seen to predict vocabulary growth over time in simulated tasks involving monolingual children (Gellert & Elbro, 2013). The well-reported “Matthew effect” (Stanovich, 1986) provides evidence that a pre-existing rich vocabulary is intrinsic to the acquisition of new vocabulary. We compared explicit and implicit learning of novel words in EAL and monolingual (ML) children aged 7-8 years old. In experiment 1, 119 children (67 = EAL; 52 ML) were explicitly taught 6 novel words with a maximum of 14 exposures. Immediately after learning, EAL children exhibited significantly better recall than ML children ($p < .01$), but this advantage did not remain 7 days later. Thus, EAL children displayed a phonological advantage for initial explicit word learning but not in longer term lexical integration. In experiment 2, 80 children (30 = ML; 50 = EAL) were exposed to 6 novel words via 2 spoken stories. This time, EAL children demonstrated poorer immediate recall compared to ML ($p < .01$) but not after a delay ($p = .54$). Children who speak more than one language may have an immediate advantage compared to MLs for explicit phonological learning, but be disadvantaged when learning is implicit. In both cases, recall decayed significantly after one week, suggesting repeated exposures may be necessary to facilitate long-term integration. Moreover, phonological aspects of novel words (learning and recall scores) were a strong predictor of English vocabulary growth a year later for EAL children, but not ML children. The results are discussed in relation to the role of existing vocabulary knowledge in learning new words and the implications for developing vocabulary screening measuring dynamic language learning capacity will be considered.

Gellert, A. S., & Elbro, C. (2013). Do experimental measures of word learning predict vocabulary development over time? A study of children from grade 3 to 4. *Learning and Individual Differences*, 26, 1–8. <https://doi.org/10.1016/J.LINDIF.2013.04.006>.

SS3.CIB.5 Contextual word learning from reading in a second language: Overcoming the lexical paradox

Irina Elgort

Victoria University of Wellington, New Zealand

Reading affords vocabulary learning opportunities but the learning journey is by no means straightforward, especially when reading in a second language (L2). Cobb (2007) presented us with a lexical paradox – L2 readers must bring to reading enough lexical knowledge to get new lexical knowledge from reading. University students, for example, are expected to acquire both conceptual and linguistic knowledge from written

input. However, contextual word learning affordances are modulated by readers' language proficiency, including size and quality of their existing vocabulary knowledge. In this talk I will consider contextual word learning in English as a second language and how it is affected by readers' proficiency and learning approaches. I will share findings from a number of experimental studies that probe the development of declarative and procedural word knowledge as well as quality of lexical representations established from reading. I will conclude by proposing a framework for optimising contextual word learning for non-native readers.

SS3. EST

Numerosity Perception

Estambul Room

Chair:

André Knops
University Paris Descartes, Paris

Humans are endowed with the ability to extract numerosity information (i.e. the number of items in a set) from various modalities and presentation modes. This is often referred to as the approximate number system (ANS). The exact cognitive and neural mechanisms underlying the ANS remain elusive. This symposium gathers numerosity researchers from different methodological backgrounds, including psychophysics, functional neuroimaging, and behavioral priming in order to foster theoretical progress. In particular, contributors focus on the role of early visual and parietal cortex for numerosity perception using functional neuroimaging (Szwed, Eger, Fornaciai). Arrighi and collaborators describe the results of psychophysical adaptation studies that suggest an abstract ANS. Finally, Dumoulin presents results from high-field fMRI studies suggesting that topographically organized neuronal populations flexibly adapt their tuning to the input. This trans-methodological approach characterizes the domain of numerical cognition. The symposium provides a platform for further developing a joint overarching framework of numerosity perception.

Speakers:

Roberto Arrighi
Marcin Szwed
Evelyn Eger
Michele Fornaciai
Serge O. Dumoulin

SS3.EST.1 Psychophysical evidence for a generalized number sense and it's link with development of mathematical abilities

Roberto Arrighi¹, Giovanni Anobile², & David C. Burr^{1,3,4}

1. *University of Florence, Florence, Italy.*

2. *Stella Maris Scientific Institute, Pisa, Italy*

3. *National Research Council, Pisa, Italy.*

4. *University of Western Australia, Perth, Australia*

Most animals possess an ability to rapidly estimate numerosity, a capacity known as number sense. It has been suggested that in humans the number sense may serve as a start-up tool to develop symbolic math but many aspects of such process are still unclear. Here we will describe a series of psychophysical experiments, largely using adaptation techniques, which clearly demonstrate the existence of a truly generalized number sense. The mechanisms extend over space, time and sensory modality, and is closely linked with action. However, despite this high generality, we found that math abilities correlate positively with sensitivity for estimation and paired-comparisons of the numerosity of visual arrays of dots but not for sequences of flashes or sounds. Overall these results support the existence of a generalized number sense but also demonstrate a specific link between mathematics and spatial numerosity.

SS3.EST.2 Touching numbers. Investigating the neural representation of numbers in dual visual/Braille alphabet readers

Katarzyna Rączy¹, Maria Czarnecka¹, Jakub Szewczyk¹, Dominika Zaremba¹, Małgorzata Paplińska⁴, Guido Hesselmann², André Knops³, & Marcin Szwed¹

1. *Jagiellonian University, Krakow, Poland.*

2. *Psychologische Hochschule Berlin, Berlin, Germany.*

3. *University Paris Descartes, Paris, France.*

4. *The Maria Grzegorzewska University, Warsaw, Poland.*

Parietal cortex is thought to play a pivotal role during numerosity processing. Neural assemblies in parietal cortex have been argued to respond to numerosity information from various modalities (e.g. visual or auditory), notations (e.g. number words or Arabic digits) or modes (e.g. spatially or temporally distributed items). Here, we tested a unique population of adults who can read numbers in both visual (Arabic) and tactile (Braille) modalities in two studies. Using number words and Braille numbers as primes while measuring naming latencies, we observed a strong facilitation for repeated stimuli with little evidence for semantic facilitation. Multivariate decoding of symbolic numbers (Braille & Arabic digits), and non-symbolic numerosities, in turn, revealed that symbolic numbers and dot-patterns can be successfully decoded from the IPS with very limited trans-notational generalization. Together, these results suggest that parietal cortex activity may not necessarily reflect a shared semantic code.

SS3.EST.3 Numerical and non-numerical quantity across the human dorsal visual stream – separable representations and interactions

E. Castaldi¹, M. Piazza², S. Dehaene¹, A. Vignaud¹, & E. Eger¹

1. *CEA Neurospin, France*

2. *University of Trento, Italy*

Humans and other animals base important decisions on estimates of number, and neuroscientific evidence points to parietal cortex as a crucial substrate of this ability. However, it remains debated whether an independent neuronal processing mechanism underlies the “number sense”, or whether number is instead

judged indirectly on the basis of other quantitative features. Experiments using high-resolution high-field fMRI in humans show that numerosity explains a significant amount of variance in activation patterns above and beyond the combination of multiple other quantitative dimensions, within several regions across the dorsal visual stream. Furthermore, attending to number enhances specifically the numerical information, supporting a processing mechanism dedicated to numerosity separate from other quantities from early stages of processing on. On the other hand, associated non-numerical quantities as item size can bias the read-out of numerosity from activity patterns to a different degree across regions, suggesting a possible neurophysiological correlate of perceptual interference effects.

SS3.EST.4 Building a numerosity representation in early visual cortex

Michele Fornaciai & Joonkoo Park

University of Massachusetts, Amherst, MA, USA

Research in the past years provided a growing amount of evidence characterizing numerosity perception. However, when, where, and how a numerosity representation is constructed across the visual processing hierarchy is still unclear. In a series of studies using psychophysics, EEG, and fMRI, we characterize the dynamics of numerosity representation and the processes that may be involved in building it. Neuroimaging results show that a numerosity representation is progressively constructed across two stages in early visual cortex: the first at around 100 ms post-stimulus in area V2, representing a rough, unsegmented numerosity; the second at 150 ms in area V3, representing a more refined set of segmented objects. Psychophysical results further show that these two stages likely reflect the integration of different feedforward signals carrying rough and fine-grained information, respectively. Our findings thus highlight the active and constructive nature of brain processes supporting our visual sense of number.

SS3.EST.5 How the brain represents numerosity: 7T MRI, topographic maps and population receptive field dynamics

Serge O. Dumoulin^{1,2,3}

1. *Spinoza Centre for Neuroimaging, Amsterdam, Netherlands.*

2. *University Amsterdam, Amsterdam, Netherlands*

3. *Utrecht University, Utrecht, Netherlands*

Numerosity, the set size of a group of visual items, helps guide behavior and decisions. Using ultra-high field MRI at 7T and population receptive field modeling, we have described neural populations responding to specific numerosities organized in systematic topographic maps, analogous to primary sensory and motor cortical maps. These numerosity maps extend topographic principles to higher-order features in association cortex. We will also show why the reconstruction of these maps, and cognitive neuroscience in general, needs 7T MRI. Further experiments demonstrate that these topographic representations extend to object size-tuned responses that are associated in overlapping maps. This suggests that these maps may form a generalized quantity representation. Last, while perceptions of small and large numerosities differ in many aspects, they both elicit responses in the same numerosity maps. This result suggests that neuronal populations in topographic numerosity maps dynamically adjust their numerosity tuning to follow the presented numerosity range.

SS3.ATE**Beyond this Reality: VR as a Paradigm for Interactive and Embodied Social Cognition*****Atenas Room***

Chairs:

Roberta Sellaro

Leiden University

Michiel M. Spape'

University of Helsinki

New advances in virtual reality (VR) technologies along with the currently affordable costs of associated equipment have led scientists to consider VR as a useful tool for carrying out experimental studies in a variety of fields of psychology and neuroscience. The increased use of VR in psychological research is mainly due to the unique advantages that this technology offers over traditional experimental settings such as tighter control of the environment, the possibility of creating more ecologically valid research protocols, and of subtly manipulating features of the environment and/or of the participant to assess their influence on people's behaviors and decisions. In this symposium we will provide an overview of recent applications of VR demonstrating the unique opportunities that this technology provides to inform empirical researchers and interventionists on how (normal and altered) interactive social processes come into play.

Speakers:

Roberta Sellaro

Ville J. Harjunen

Michiel M. Spape'

Ruud Hortensius

Vanessa Era

SS3.ATE.1 Contingency between self- and other-generated actions mediates the positive social consequences of imitation: A virtual reality study

Sellaro, R., de Heer, S., & Hommel, B.
Leiden University, Leiden, The Netherlands

When engaging in social interactions people tend to automatically take over each other's behaviours in terms of voice pitch and tone, facial expressions, bodily gestures and movements. Interpersonal imitation is adaptative and it is assumed to give rise to positive social consequences, such as increased likability, social affiliation and interpersonal trust. It has been proposed that the behavioural and social effects of imitation can be attributed to the detection of the contingency between self- and other-generated actions and taken to reflect general associative learning processes. Consistent with this hypothesis, in this talk I will describe recent results, obtained by using immersive virtual reality, showing that contingency and, therefore, predictability between executed and observed movements contributes crucially to the social effects of imitation.

SS3.ATE.2 Using virtual embodiment to reduce ethnic ingroup bias in vicarious pain response: Evidence from event related oscillations and autonomic nervous system activity

Harjunen, V.J.^{1,2}, Sjö, P.¹, Ahmed, I.², Farmer, H.^{3,5}, Salminen, M.^{4,1}, Järvelä, S.¹, Ruonala, A.², Jacucci, G.⁵, & Ravaja, N.^{1,2}

1. *Aalto University, Helsinki, Finland.*
2. *University of Helsinki, Helsinki, Finland.*
3. *University College London, London, United Kingdom.*
4. *Tampere University, Tampere, Finland.*
5. *University of Bath, Bath, United Kingdom.*

Previous research has demonstrated that observers exhibit greater vicarious pain responses to victims with similar skin color. The present study examined whether embodying a virtual body of different color than one's own reduced this ethnic ingroup bias. Immersive virtual reality, motion tracking and photorealistic virtual bodies were used to embody the participants to a 3D human body with a similar or different skin color. Then, sensorimotor EEG oscillations (ERD/ERSs), electrocardiography (ECG), and electrodermal activity (EDA) were measured while showing black, white and violet virtual humans in noxious (e.g. injected by a needle) or non-noxious situations (e.g. touched with a feather). The results demonstrated that putting oneself in virtual body of an ethnic outgroup member reduces ingroup bias in sensorimotor beta oscillations and galvanic skin responses evoked by the vicarious pain stimuli. The symposium presentation will further elaborate the EEG findings and their theoretical implications.

SS3.ATE.3 Neurosemiotics: The use of EEG in VR to understand intention in communication

Spape', M.M.¹, Ahmed, I.², Jacucci, G.², & Ravaja, N.^{1,2}

1. *Aalto University, Helsinki, Finland*
2. *University of Helsinki, Helsinki, Finland.*

Communication requires understanding of explicit language as well as social-emotional intentions behind messages. Previous research has long shown that verbal- and non-verbal context, such as intonations, postures, touch, and expressions, dramatically alter interpretation of messages, yet the mechanisms behind this remains unknown. We propose that the semiotic process operates similar to other binding problems, in which an explicit message (e.g. a positive message) may retrieve conflicting information (e.g. a negative expression) if they are both bound to the same context (messenger). To investigate, we used EEG within virtual reality, and show that emotional expressions, displayed via artificial agents, interact with the

psychophysiological processing of the agent's message content. Interestingly, this only seems to occur after the message itself has been processed, implying a role for episodic retrieval. VR technology, while still a 'frontier technology' presenting strong methodological challenges, is thus shown to provide unique opportunities for social cognition research.

SS3.ATE.4 Probing social cognition during violent conflicts

Ruud Hortensius

University of Glasgow, Scotland

Violent conflicts lead to a myriad of responses in individuals. Combining the experimental control and realism of Virtual Reality, I will discuss a series of experiments that provide new insight on the perception *and* experience of distress within an individual during violent conflicts. First, I will show how behavioural reactivity to distress and self-reported decision making can predict helping behaviour during a violent conflict. Next, I will show how the first-person experience of distress can lead to improved recognition of female fearful facial expressions in male domestic violence offenders. In the final experiment, I will discuss how the direct experience of a life-threatening situation influences neural mechanisms underlying social threat perception. Together, Virtual Reality, inter-individual difference measures and functional magnetic resonance imaging allow researchers to study distress phenomenology, physiology, and behaviour during violent conflicts that are invisible to the realm of traditional psychological methods.

SS3.ATE.5 Neural basis of human-avatar motor interactions in healthy and clinical populations

Vanessa Era^{1,2} & Matteo Candidi^{1,2}

1. *"Sapienza" University of Rome, Italy.*

2. *IRCCS, Fondazione Santa Lucia, Rome, Italy.*

Social neuroscience research is struggling to go beyond the study of cognition and brain activity in individuals who merely react to social contexts. With this aim, we developed an experimental set-up, which requires participants to coordinate and synchronize their reach-to-grasp movements during cooperative or competitive interactions with real or virtual partners, in order to fulfil a (motor) goal. By means of inhibitory transcranial magnetic stimulation, we demonstrated that the parietal cortex (left anterior intraparietal sulcus and right temporo-parietal junction) is essential in supporting humans' ability to coordinate with both virtual partners and with other humans in both cooperative and competitive social contexts. Moreover, we also showed that brain damaged patients with fronto-parietal lesions and showing motor difficulties (apraxic patients) improve their motor behavior when interacting with a virtual partner. Thus motor interactions might be exploited for the development of novel rehabilitation protocols for patients with motor disorders.

SS3.StT
**Spontaneity in Future Thinking: A Forward-Looking
Research Symposium**

Saint Tropez Room

Chair:

Scott Cole
York St John University, York, UK

Spontaneous thought and future thinking are two intersecting research fields which have seen a pronounced surge of interest in recent years. Here, we present work from a variety of perspectives, examining the role of incidental triggers in future thinking; the potential importance of cognitive inhibition; the impact of visuo-spatial orienting; and the neural substrates that support access to such thoughts. Talks will consider spontaneous future thinking in relation to involuntary memory, given the shared neurocognitive architecture evidenced in the literature. Our discussant, Martin Conway, brings a wealth of knowledge relating to autobiographical memory and – from his more recent work – the similar mechanisms by which both memories and future thoughts are accessed. The lines of research represented in the symposium offer a range of tentative answers as to how (functionally and contextually) future thinking may be spontaneous, probing its position in relation to other forms of spontaneous thought.

Speakers:

Manila Vannucci
Elisa Ciaramelli
Krystian Barzykowski
Helgi Clayton McClure
Scott Cole

SS3.StT.1 When our mind wanders, where does it go? Visuo-spatial processing affects the temporal orientation of spontaneous mind-wandering

Manila Vannucci

University of Florence, Florence, Italy

Previous studies in young adults have shown that mind-wandering (MW) is typically directed towards times other than the present. Despite the widely-reported prospective (i.e. future) bias, the temporal focus of MW might be more flexible than originally thought, as shown by various experimental manipulations. Moreover, time is typically processed with reference to a spatial continuum, or 'mental time line' (MTL), consistent within a given culture. Across several studies we investigated the extent to which visuo-spatial processing influences the temporal orientation of MW by experimentally inducing leftward versus rightward orienting of attention. Our findings confirm that the proportion of spontaneous future-oriented MW episodes was higher for rightward than for leftward orienting of attention, and vice versa for past-oriented episodes. Possible mechanisms and implications for research on MW and spontaneous future thinking are discussed.

SS3.StT.2 A mind free to wander: Role of the vmPFC and the hippocampus in the construction of spontaneous thought

Elisa Ciaramelli

University of Bologna, Bologna, Italy

The ventromedial prefrontal cortex (vmPFC) and the hippocampus are crucial nodes of a core network of brain regions whose activity is enhanced when individuals voluntarily remember past events and imagine future events. These regions are also activated during mind-wandering, when attention drifts away (automatically) from the current task and focusses on events alternative to direct perceptual experience, such as memories or plans for the future. I will present data from experiments involving brain-lesioned patients and using direct current stimulation (tDCS) to demonstrate that the vmPFC and hippocampus play necessary and complementary roles in both voluntary and spontaneous forms of event construction. They also examine the critical role of verbal cues in mind-wandering in brain-lesioned individuals.

SS3.StT.3 Testing the cognitive inhibition dependency hypothesis of involuntary thoughts

Krystian Barzykowski

Jagiellonian University, Krakow, Poland

The aim of the present investigation was to examine why we are not constantly flooded by involuntary future thoughts (IFTs) and involuntary autobiographical memories (IAMs) given that they are often triggered by incidental cues while performing undemanding activities. One possibility is that activated thoughts are suppressed by an inhibitory control mechanism, and therefore depleting inhibitory control should increase their frequency. In Study 1, participants performed a 60-min Stroop task in either a high- or low-conflict condition before completing a vigilance task measuring the frequency of IFTs and IAMs; this produced groups with 'depleted' and 'intact' inhibitory control during thought reporting. Study 2 compared thought frequencies in individuals exhibiting high vs. low trait levels of inhibition. Since our findings do not clearly support the proposed inhibition mechanism, the talk will consider alternative explanations for the observed lack of 'flooding' by spontaneous thoughts.

SS3.StT.4 Don't get triggered: Clarifying the role of 'irrelevant' verbal cues in involuntary future thinking

Helgi Clayton McClure

York St John University, York, UK

Previous research has shown that involuntary thoughts of first-person past and future events can be triggered by the presence of onscreen verbal cues in a lab setting, despite instructions not to attend to the cues. The present investigation aims to replicate these findings, specifically for future-oriented thoughts (e.g. 'I'm imagining being in Paris next spring'), using sparsely presented cues. Four between-subjects conditions (goal-related phrases, future-related phrases, standard pre-validated cues and nonsense scrambled cues) were used to assess the impact of different cue properties on the frequency and characteristics of reported involuntary future thoughts. The talk will discuss preliminary results, relating them to theoretical models of future thinking and attempting to place the study in the broader context of 'spontaneous thought'.

SS3.StT.5 Spontaneity in future thinking: A discussion

Scott Cole

York St John University, York, UK

Scott Cole will draw upon his experience studying the neurocognitive characteristics of episodic future thinking to integrate the four research talks. Links between spontaneous future thinking and related areas such as prospective memory, mind wandering and involuntary memory will be examined. Finally, in this discussion, the question of whether these new findings can be interpreted in the context of recent theoretical frameworks and approaches will be explored.

SS3.TAR**Is Memory Slave to the Rhythm? Focus on the Role of Timing and Temporal Factors in Verbal Short-Term Memory*****Tarraco Room***

Chair:

Simon Gorin

Université de Genève, Switzerland

Research from rhythm cognition has provided evidences that rhythmic information can influence various aspects of cognition, for instance supporting attentional guidance or promoting language development. The question whether rhythm also plays a role in more specific contexts such as memorizing lists of verbal stimuli remains open. This symposium represents an attempt at addressing the relation between the functioning of verbal short-term memory (STM) and rhythm processing, building on research from experimental to developmental psychology, as well as cognitive modelling. We will see from experimental studies how verbal STM performance is improved when presented with musical rhythm, and how performance is affected when to-be-remembered material is rhythmically unpredictable. We will also have a look at the importance of rhythm in transferring information from STM to long-term memory, and its influence on language development. Finally, we will see how rhythmic aspects are important to build a model of auditory verbal STM.

Speakers:

Gaën Plancher
Simon Gorin
Rob Hughes
Usha Goswami
Tom Hartley

SS3.TAR.1 Boosting maintenance in working memory with temporal regularities

Gaën Plancher

Université Lumière Lyon 2, France

Music cognition research has provided evidence for the benefit of temporally regular structures guiding attention over time. In recent studies, we investigated whether working memory mechanisms can benefit from temporal regularities. We examined the potential benefit of a regular rhythm on the maintenance of serial order information in working memory. Across several experiments we asked participants to remember series of letters for serial recall. We compared conditions where a sound was presented with a regular stimulus-onset-asynchrony during the maintenance interval to a silent condition. We observed that the presence of the regular rhythm resulted in improved memory performance. Interestingly, the presence of the isochronous rhythm also improved recall performance of healthy older adults, but only when they have good inhibition capacities. Overall, the present results suggest that maintenance mechanisms of working memory can be boosted with temporal regularities, potentially because regularities help guiding attentional maintenance of memory representations.

SS3.TAR.2 Does rhythmic (ir)regularity during encoding influence serial order recall from verbal short-term memory?

Simon Gorin

Université de Genève, Switzerland

The nature of the codes underlying the representation of serial order information in verbal short-term memory (STM) is still debated. According to some models, serial order is represented through time-based, event-based, or even both, codes. As event-based and time-based theories make different predictions regarding the manipulation of presentation timing in serial recall tasks, it is argued that our understanding of the ordering codes involved in verbal STM should benefit from the study of items presentation rhythm effects. I will present the results from experiments requiring participants to recall digit lists for which items presentation timing is manipulated. Recall performance and error patterns will be compared between conditions where items are presented with an isochronous, steady rhythm or an unpredictable, unsteady rhythm. The data should shed new light on the (possible) role of rhythm in representing sequential order information in verbal STM, and contribute to constraint future models.

SS3.TAR.3 Rhythmic-motoric determinants of the relation between verbal serial recall and verbal learning

Rob Hughes & Amanda Sjöblom

University of London, United Kingdom

The dominant account of verbal serial short-term memory posits a distinct phonological short-term store whose evolved function is verbal sequence learning (Baddeley, Gathercole, & Papagno, 1998). We examined an alternative approach wherein these functions are supported by motor planning (as well as perceptual organization with auditory sequences). Contrary to previous work, we show first that the Hebb repetition effect—the enhancement of verbal serial recall performance for a repeated sequence in amongst non-repeated sequences—is attenuated when vocal-motor planning of a visually-presented to-be-remembered sequence is restricted by articulatory suppression. Second, when the repeating sequence was presented in different temporal groupings across repetitions, learning was abolished but only when that grouping—based on evidence from output response-times during serial recall—was mimicked within the motor-plan

supporting its short-term recall. We argue that verbal serial short-term memory and learning are supported by general-purpose, temporally-structured, motor-plans, not mnemonic systems specialized for verbal input.

SS3.TAR.4 The role of rhythm patterns in children's language development and short-term memory

Usha Goswami

University of Cambridge, United Kingdom

Rhythm patterns are a core aspect of speech encoding by the brain. Using recent neural insights, I will provide an overview of key factors underpinning individual differences in children's development of language, phonology and short-term memory. The framework will be a neural oscillatory "temporal sampling" perspective for linking rhythmic auditory processing to language acquisition by infants and young children. I will show that children with phonological impairments (developmental dyslexia) are relatively insensitive to speech and non-speech rhythm, and that this relates to acoustic insensitivity to amplitude modulation patterns. Infant-directed speech exaggerates core amplitude modulation patterns to aid language acquisition. This enhances prosodic structure, yet children with dyslexia struggle to recover prosodic structure from the speech stream. Nevertheless, dyslexic children show prosodic similarity effects in short-term memory, just as other children do.

SS3.TAR.5 What cognitive function(s) does neural entrainment to speech subserve? Possible answers and predictions from a model of auditory-verbal short-term memory

Tom Hartley

University of York, United Kingdom

Hartley, Hurlstone and Hitch (Cognitive Psychology, 2016) show that temporal grouping effects in auditory-verbal short-term memory are insensitive to foreknowledge about list structure, suggesting that bottom-up processes exploit rhythm in encoding the timing and serial structure of spoken material. This talk gives an intuitive and non-technical overview of the mechanism at the heart of their model, highlighting some of its explanatory strengths and weaknesses from the standpoint of theoretical integration in the overlapping areas of rhythm, verbal short-term memory, language development, and in linking specific cognitive functions to neural entrainment. Falsifiable predictions will be identified.

SS3.BAR

Negation Processing: New Insights and Models

Barcelona Room

Chair:

David Beltrán
Universidad de La Laguna. Spain

Negation is a ubiquitous feature of human languages with critical functions in communication and cognition. Negation is important because, among other things, it helps to represent the world in ways that deviates of what is actually the case, bringing so into the mind the concepts of opposition and alternative worlds. To explain this powerful function, cognitive researchers have focused on what is represented as a result of, and during the comprehension of negative sentences, and more recently on the processes and neurocognitive mechanisms used to build and manipulate the involved representations. In this symposia, new findings and ideas regarding negation processing will be presented. Two talks will introduce processing models that places special emphasis upon how context modulates what is represented during negation understanding, while the other three will discuss evidence concerning the reuses by negation of domain-general processes associated with the control of perceptions and actions.

Speakers:

Ruth Mayo
Isabel Orenes
Carolin Dudschig
David Beltrán
Bo Liu

SS3.BAR.1 Effective and spontaneous negation

Ruth Mayo

The Hebrew University of Jerusalem

The main conceptualization these days is that in the process of understanding information, one must first believe and only later one is able to negate. Negation is considered a secondary process, demanding awareness and cognitive resources and therefore at risk of failure. This "negation as a secondary process" perspective lies at the heart of known effects such as false memory and misinformation. I will introduce two models for the negation process and suggest that while one may lead to a negation failure, the other offers a successful negation process that, for example, may diminish false memory and enable correction of misinformation. Furthermore, I will present empirical research demonstrating a spontaneous negation process, eliminating accessibility effects (e.g. priming, confirmation). The conclusion offered is that our mind is equipped with a successful and spontaneous negation process and that the question of our default response –acceptance or negation– is context dependent.

SS3.BAR.2 The time-course of processing counterfactual and negation: Evidence from the visual world paradigm

Isabel Orenes, Juan Antonio Madruga, Orlando Espino, & Ruth M.J. Byrne

Universidad Nacional de Educación a Distancia (Madrid)

Negation and counterfactual are both linguistic devices which comprehension calls for dual models of representation. We report two eye-tracking studies to examine how people process these two possibilities and whether they are equally accessible. In Experiment 1, people heard affirmative and negative counterfactuals (e.g. "if you had (not) arrived early, you would have (not) bought roses") while looking at four printed words on a computer screen (e.g., roses, no roses, carnations, no carnations). The results showed that participants first looked at 'roses' and then its implicit negation, 'carnations'. In contrast, for negated counterfactuals, they looked only at 'roses'. In Experiment 2, we corroborated these results for affirmative counterfactuals in binary contexts (there were roses or carnations in the shop) and multiple contexts (there were roses or carnations or lilies or daisies). We discuss how the understanding of counterfactuals and negation affects the accessibility of the two possibilities.

SS3.BAR.3 Negation as conflict

Carolin Dudschig & Barbara Kaup

University of Tübingen

Negation processing is often associated with the activation of two competing meaning representations. According to this view, a sentence such as "The door is not closed" activates both the representation of an open and the representation of a closed door. Interestingly, this phenomenon highly resembles the notion of conflict as typically studied in the Stroop-, the flanker- or the Simon-tasks. In our studies, we investigate in how far negation processing involves conflict-adaptation mechanisms that are well known from conflict processing in the above mentioned tasks. We will report a series of electro-physiological experiments that aimed at finding out whether during negation processing indeed two competing representations are activated and whether this conflicting situation then results in conflict adaptation effects.

SS3.BAR.4 Negation as inhibition

David Beltrán & Manuel de Vega

Universidad de La Laguna. Spain

The inhibition of the concepts under its scope is one of the most well-replicated cognitive consequences of negation. But how this inhibitory role is implemented at a neurocognitive level is still poorly understood. Based on the idea of neural redeployment, we have recently proposed that negation reuses evolutionary ancient mechanisms, in particular those involved in the control of actions. In support of this proposal, we reported an interaction between linguistic negation and well-known neurophysiological markers of response inhibition. Here, we will introduce new evidence to reinforce and extend it. Firstly, we will show that the interaction with response inhibition markers is not restricted to the negation of action concepts; instead, it happens regardless of the semantic modality, and hence involves a domain-general mechanism of negation. Secondly, we will present an EEG functional localizer study which shows that the neural network underlying response inhibition is active during the comprehension of negative sentences.

SS3.BAR.5 Response inhibition influence on negation comprehension

Bo Liu, Manuel de Vega, & David Beltrán

Universidad de La Laguna. Spain

The Response Inhibition in Negation (RIN) hypothesis holds that the inhibitory-like consequences of negation imply the reuses of neural mechanisms of response inhibition. Supporting evidence has laid emphasis only on the modulatory effect of negation on motor inhibition, without touching the reverse side. We tested in an ERP experiment whether motor inhibition modulates subsequent comprehension of sentential negation, as indexed by modulations of the semantic N400 component. To that end, participants performed a GNG task before reading either an affirmative or a negative sentence (“now you will cut the bread” vs “now you will not cut the bread”). Verbs in the Nogo-negative condition elicited larger N400 amplitudes than all other conditions, suggesting more difficulty to integrate them into the preceding semantic context. Regarding the RIN hypothesis, this finding supposes an additional probe of the sharing of inhibitory mechanisms by both response inhibition and negation processing.

SS3.PAL
New Findings and Approaches on Strategic Variations
in Human Cognition

Palma de Mallorca Room

Chair:

Svenja Hammerstein
Goethe Universität, Frankfurt

Two decades of research on human cognition robustly found that participants use several strategies to accomplish a wide variety of tasks in most cognitive domains, that strategies used by participants are crucial determiners of their performance, and that numerous variables influence participant's strategy selection and execution processes. The present symposium will discuss research that offers new insights into some of these factors involved in strategy use and present advances in approaches to infer which strategies were chosen. The first three presentations focus on new data on lifespan developmental changes in arithmetic strategies. Two of them also examine how age-related changes are moderated by either the presentation format of the task or prior-task success. The last two presentations used multi-method designs to assess which cognitive strategies were chosen. Both make new proposals regarding how to improve strategy assessment.

Speakers:

Jeanne Bagnoud
Svenja Hammerstein
Patrick Lemaire
Patrick Lösche
Sebastian Poloczek

SS3.PAL.1 The use of the Min, First, and Sum strategies for addition problems in children

Jeanne Bagnoud & Catherine Thevenot

Université de Genève, Switzerland

Strategies to solve addition problems evolve considerably during the first years of schooling. It has been described that children initially use a Sum strategy, corresponding to the fact that both operands are represented either mentally or on fingers before being added up. This strategy is replaced by a First strategy, where children count-on from the first of the two operands. The more sophisticated Min strategy, which consists in counting-on from the minimum addend, is then used. In this study, children from different grades were asked to orally solve simple addition problems involving operands from 1 to 9 and solution times were collected for each problem. Children's strategies were inferred from solution times by considering the best predictors depending on the types of problems (e.g., tie, non-tie, $n + 1$). The evolution of solution times and therefore of the inferred strategies were considered during the course of children's development.

SS3.PAL.2 The influence of presentation format on elementary-school children's strategy use in computational estimation

Svenja Hammerstein & Gerhard Büttner

Goethe Universität Frankfurt, Germany

The present study investigated how different presentation formats influenced children's strategy use in computational estimation with a choice/no-choice paradigm. Third and fourth graders ($N = 769$) were asked to find estimates for two-digit addition problems (e.g., $42 + 76$). In the choice condition, children were told to choose between the rounding-down (i.e., rounding both operands down to their nearest decades), the rounding-up (i.e., rounding both operands up) and the mixed-rounding strategy (i.e., rounding one operand up and the other down). In the no-choice condition, the best strategy to execute was cued on each problem. Additionally, children were randomly assigned to one of three presentation conditions: (1) time-unlimited visual, (2) time-limited visual, or (3) auditory. Results showed that children's strategy selection and execution were influenced by the presentation format. Interestingly, this influence was moderated by children's age. These findings have implications for our understanding of processes involved in arithmetic strategy use and development.

SS3.PAL.3 Arithmetic performance are modulated by prior-task success in young and older adults

Patrick Lemaire

Aix-Marseille Université & CNRS, Marseille, France

We tested whether and how participants improve arithmetic performance after successfully accomplishing a prior task. Young and older participants ($N = 162$) accomplished computational estimation tasks (i.e., providing the best estimates to arithmetic problems) under a success or a control condition. Following success, although both young and older adults increased their performance, older adults outperformed young adults. Moreover, prior-task success led older (but not younger) adults to select the better strategy on each problem more often and to repeat the same strategy more often when it was appropriate or less often when inappropriate. We also found that better strategy use mediated effects of prior-task success in older adults and that individual differences in baseline performance moderated individuals' sensitivity to effects of prior-task success. These findings further our understanding of mechanisms underlying effects of prior-task success and, more generally, provide new perspectives on arithmetic processing, on cognitive aging, and on how social environment modulates age-related differences in cognitive performance even in specific domains like arithmetic.

SS3.PAL.4 Identifying fraction comparison strategies through eye-tracking

Patrick Lösche

Goethe Universität Frankfurt, Germany

Previous research suggests that strategies for solving fraction comparison tasks can be identified from self-reports. Here, we investigated whether it is possible to identify strategies from patterns of eye-movements. We asked 34 participants to compare fractions and decide which one is larger. We recorded think aloud protocols and tracked pupil movement. The stimulus material was designed so that each problem would favor a specific strategy. Results suggest that distinct eye-tracking patterns emerge for a subset of strategies (simple comparison of numerator/denominator and advanced multiplication for common denominator). However, strategies identified from eye-tracking only rarely overlap with self-reported strategies. This suggests that participants were not always self-aware of their solution approaches, and that non-reactive methods such as eye-tracking, could serve to more accurately infer strategy use in fraction comparison.

SS3.PAL.5 Integrating multiple data sources to study strategy development

Sebastian Poloczek^{1,2}, Klaus Oberauer³ & Chris Jarrold¹

1. *University of Bristol, UK.*

2. *Goethe Universität Frankfurt, Germany.*

3. *University of Zurich, Switzerland.*

Often, no single data source is perfect for inferring cognitive strategy use in children. Trial-by-trial self-reports can provide a detailed insight into children's strategy choices; however, only if the child's metacognitive awareness is developed well enough and valid self-reports are given. Behaviour-based indicators also do not map one-to-one onto cognitive strategies. Children between the age of 6 and 11 ($N = 144$) completed an immediate serial recall experiment and gave self-reports after each trial; self-paced presentation time patterns linked to strategy use were recorded; and spontaneous strategy-related verbalisations were systematically observed. We developed a Bayesian Cognitive Model to infer each child's preferences for listening, single rehearsal, cumulative rehearsal and other memory strategies based on three data sources (self-reports, time patterns and observed verbalisations). The model as well as comparisons between simulated data based on the model and collected data will be presented and implications for strategy research will be discussed.

SYMPOSIUM SESSION 4

Saturday 28th

10:00-11:40

SS4.AUD
Bilingualism, Development and the Brain:
A Neuroemergentist Perspective

Auditorio

Chair:

Arturo E. Hernandez
University of Houston

The ability to flexibly adapt to a new set of circumstances is a hallmark of language and cognitive development. This symposium will present work that considers the nature of plasticity in the learning of a second language where the brain must adapt to two sets of sounds, scripts and meanings. The presentations consider a number of circumstances which yield variety in language processing. This includes work describing how bilingual infants adapt to processing of two languages during very early stages of development. Work with trilinguals will look at the effects of two languages on the learning of a third. The final presentation seeks to look at how language proficiency, age of second language acquisition interacts with individual differences across development. The final presentation broader view, Neuroemergentism, the notion that both the content of cognition and the neural substrate underlying it, transition from simple to complex processing in a non-linear manner. This Neuroemergentist approach offers a more nuanced view of the effects of experience which captures the dynamic nature of language development in speakers of more than one language.

Kalashnikova, M., D'Souza, D., Thierry, G., Morrison, C., & Hernandez, A.E.

Speakers:

Marina Kalashnikova
Dean D'Souza
Guillaume Thierry
C. Morrison
Arturo E. Hernandez

SS4.AUD.1 Early speech perception development in Spanish-Basque bilingual infants

Marina Kalashnikova & Manuel Carreiras

Basque Center for Cognition, Brain and Language

The effects of early bilingual exposure on speech perception development are debated. Inconsistent findings have been attributed to the inclusion of bilinguals acquiring language pairs that vary extensively in their degree of phonological and lexical overlap, and due to variability in infants' individual language exposure patterns. This study assessed speech perception in infants acquiring Spanish and Basque, two phonologically similar, but lexically and grammatically distinct languages. A visual fixation habituation paradigm was used to assess nine-month-old monolingual and bilingual infants' ability to discriminate the native /pa-/ba/ and non-native /pa-/pha/ contrasts. Results showed that monolingual and bilingual infants discriminated the native, $p=.034$, but not the non-native contrast, $p=.929$, demonstrating attunement to native phonetic categories. Importantly, in the bilingual group, native discrimination was correlated to individual degrees of bilingualism, $r=.615$. Thus, infants with greater bilingual exposure showed weaker attunement to their native phonetic categories even when acquiring two phonologically similar languages.

SS4.AUD.2 Is mere exposure enough? The effects of bilingual environments on infant cognitive developmentDean D'Souza¹, Daniel Brady², Luke Mason³, & Hana D'Souza⁴1. *Anglia Ruskin University*2. *University of Reading*3. *Birkbeck, University of London*4. *University of Cambridge*

Bilinguals purportedly outperform monolinguals in nonverbal tasks of cognitive control. However, inconsistent results, combined with publication bias, has led many scientists to question whether the bilingual advantage is real. To progress beyond the controversy and advance our understanding, in addition to carrying out more studies, we must develop a framework that can account for the inconsistencies in the literature and explain when, how, and why learning two or more languages improves cognitive control. The most influential explanation for the bilingual advantage is the proposal that managing two or more languages during language production constantly draws upon, and thus strengthens, domain-general cognitive control processes. According to this model, infants raised in bilingual homes should not show a bilingual advantage before they can produce language. Yet studies suggest that they do. We argue that exposure to more varied language environments drive infants to explore more by constructing less detailed models of their environments and placing more weight on novel information. Getting by on less detailed models would allow the child to switch more and faster to novel stimuli and thus sample more from their environments. We will present infant data ($n = 102$) from several experiments designed to test our hypotheses.

SS4.AUD.3 Evidence for parallel unconscious processing in the bilingual mind: Dual power under cover?

Guillaume Thierry

Bangor University, Wales

In this talk I will show how bilinguals engage in high-level mental operations spontaneously even when the tasks they are asked to do require no such complex processing. I will focus on results from three experiments (Wu and Thierry 2012; Wu et al., 2016; Li et al., submitted) in which Chinese-English bilinguals either (i) filter out semantic access to negative emotional context, (ii) access the meaning of part-translations and change

their looking behaviour accordingly, and (iii) access metaphors that only exist in their native language and process them in context, when the experiments were conducted in English and participants were completely unaware of their engagement in sophisticated, abstract cognitive processing. In all cases the task requirements were deceptively simple: (i) semantic relatedness decision, (ii) spot circle or square shapes, (iii) indicate whether gaps in time between heard stimulus and present time were 1 or 2 day/year. And in all cases, their brain manifested clear signs of engaging with cognitive operations entirely irrelevant vis-à-vis the tasks at hand but targeted by factor manipulations in the experimental designs used: (i) selective inhibition of access to Chinese translation equivalents in the case of English words with a negative valence, (ii) particular attention to English words semantically related to the concept of circle or square via translation into Chinese, and (iii) processing difficulty in the case of English dates conflicting with spatiotemporal metaphors of Chinese in terms of configurations of relative time (future / past) and physical origin in space (front / back). All in all, these findings provide support for the provocative idea that bilinguals in fact have two minds operating in parallel, both being as unconscious that the presumably unique mind operating in monolinguals.

SS4.AUD.4 Differences in working memory ERPs between Arabic-English and English-French bilinguals

Morrison, C.^{1,2}, Kamal, F.^{1,2}, & Taler, V.^{1,2}

1. *University of Ottawa, Canada*

2. *Bruyère Research Institute, Canada*

The study of whether bilinguals exhibit cognitive advantages over monolinguals has been a controversial area of research. Inconsistent findings may be due to methodological differences within and across studies. One major limitation is that many studies focus on comparing Indo-European languages such as English, French, and Spanish. The purpose of this study was to compare working memory performance and the underlying brain activity between Arabic-English bilinguals and English-French bilinguals. Participants completed a n-back working memory task while reaction time, accuracy, and electroencephalography were recorded. Preliminary data show that behavioural data between the groups are similar, whereas electrophysiological measures differ. The P3b was larger in English-French bilinguals than monolinguals but not Arabic-English bilinguals. Additionally, P3b amplitude did not differ between Arabic-English bilinguals and monolinguals. These results suggest that the conflicting findings across bilingualism studies may be due in part to characteristics of the languages under study.

SS4.AUD.5 Genetics, plasticity and cognitive control: A neuoremergentist approach

Arturo E. Hernandez

University of Houston

Does bilinguals have better cognitive control or does better cognitive control lead to better bilinguals? Whereas recent work in the literature has focused on the debate of whether bilingual possess some advantage over monolinguals, there has been much less attention paid to the factors that might mediate these differences. In the present talk, work that has begun to look at the potential role of genetics and language history in bilinguals will be presented. Recent work reveals that bilinguals relative to monolinguals have a higher proportion of individuals carrying the A1 allele of the Taq1A polymorphism which has been associated with better task switching performance. We have also found evidence that carrier status of this gene as well as language history factors are associated with different patterns of brain activity in bilinguals. Finally, results from language proficiency tests show that balanced bilingualism is dependent on age of acquisition and A1 carrier status. Taken together these results are consistent with a complex relationship between language experience and genetics.

SS4.CIB**Motivation for Effort: Physiology, Behaviour and Neural Computations of How Humans Face Cognitive and Physical Challenges*****Cibeles Room***

Chair:

Eliana Vassena

Donders Institute for Brain, Cognition and Behaviour

Motivation is the core driver of most human endeavors, and its impairment is highly debilitating in neuropsychiatric disorders. Motivated behaviour generally requires expenditure of physical and/or cognitive effort. The willingness to exert effort to obtain a reward has received growing attention in psychology research. However, an integrative view on the underlying cognitive and neural mechanisms is still lacking. This symposium combines behavioural, neural, and physiological evidence on when, how and why humans choose to engage in effortful behaviours. Eliana Vassena will discuss the neurocomputational mechanisms underlying decision-making and preparation for effort. Ross Otto will show how behaviour and pupillometry capture effort/reward trade-offs, and inter-individual variability. Matthew Apps will describe a model of motivational fatigue, explaining how exertion of physical effort affects subsequent decisions. Guido Gendolla will show that affective priming alters effort mobilization. Finally, Jacqueline Scholl will describe how humans learn when actions are effortful and rewarding, and how perseverance is related to clinical symptoms.

Speakers:

Eliana Vassena

Ross Otto

Matthew Apps

Guido H.E. Gendolla

Jacqueline Scholl

SS4.CIB.1 Choosing to make an effort: Neurocomputational mechanisms and potential for behavioural change

Eliana Vassena

Donders Institute for Brain, Cognition and Behaviour

Capturing the neural mechanisms underlying motivation for effort is essential to understand clinical conditions in which this skill is impaired. Combining fMRI and computational modeling, we examined the neural mechanisms driving the choice to engage in mentally effortful behaviour. In a first experiment, we demonstrate a critical role of dorsal Anterior Cingulate cortex during decision-making about effort as well as during preparation for effortful cognitive performance. We propose meta-learning as cortico-subcortical mechanism regulating dACC interaction with brainstem nuclei, controlling decisions to engage and performance. We successfully simulate brain and behavioural results. In a second experiment, we investigate the effect of prioritizing effort as opposed to prioritizing reward information on effort-related decisions and performance. In line with model-simulations, the results show that prioritizing reward leads to reduced effort avoidance, and improves performance accuracy. Overall, these approaches indicate novel translational avenues, with potential for devising intervention tools to reduce motivational deficits.

SS4.CIB.2 Understanding cost-benefit decision-making about cognitive effort

Ross Otto

McGill University

Our ability to perform tasks is constrained by our limited mental resources, which mandates that people should minimize use of cognitively “effortful” processing when possible. Recent theories posit that decisions to expend effort are governed by a cost- benefit tradeoff, whereby the potential benefits of effort can offset its perceived costs. I will present a series of recent, computationally-informed experiments combining behavioural experimentation and pupillometry to gain critical insights into understanding when and why we allocate—or withhold—cognitive effort, both from an individual differences perspective, and at the level of the task by examining the effect of changes in costs and benefits. We find that individual differences in cognitive capacity— and relatedly, intrinsic motivation—govern trial-to-trial adjustments to cognitive effort expenditure in accordance with shifts in costs (i.e., opportunity costs) and benefits (i.e., rewards). Further, we find that task-evoked pupillary responses can elucidate internal computations of these effort allocation decisions.

SS4.CIB.3 Neuro-computational Mechanisms of Motivational Fatigue in Health and Parkinson’s Disease

Matthew Apps

University of Oxford

Fatigue - a feeling of exhaustion arising from exertion - is one of the most common symptoms in primary medicine and is highly prevalent in Parkinson’s Disease (PD). Healthy people also show the effects of fatigue after exertion with accuracy and vigour declining with time-on-task. Prominent theories propose that fatigue increases after effort, declines through rest, and that this fluctuating subjective “feeling” impacts on motivation. However, formal models that can account for moment-to-moment fluctuations in fatigue, motivation, and their neural underpinnings have not been forthcoming. Here, I put forward a computational framework of momentary fatigue and test its ability to explain trial-to-trial variability effort-based decision-making. Using this framework in conjunction with fMRI I will highlight how systems in the healthy brain linked to

effort-based decisions-making are under the influence of momentary levels of fatigue that influence the motivation put in effort and 'work'. Moreover, I show that this model can provide a computational signature of impaired motivation in PD.

SS4.CIB.4 Prime awareness and task context moderate implicit affective influences on effort mobilization

Guido H.E. Gendolla & David Framorando

University of Geneva

Research on the implicit-affect-priming-effort model (Gendolla, 2012) has revealed ample evidence that implicitly processed facial expressions of emotions influence effort-related cardiac response (especially cardiac pre-ejection period) during cognitive performance: As long as success is possible and justified, processing sadness or fear primes during task performance results in higher effort than implicit activation of the happiness or anger concept. However, recent studies revealed that these effects depend on unawareness of this affective influence. Making people aware of the presentation of the affect primes or their effect turned out to be a boundary condition of implicit affects' systematic impact on effort mobilization. Other research found that affect primes only systematically influenced effort when they were processed in an achievement context that called for effort and in which implicit affect could inform about task demand. When the affect primes appeared in a "just watch" context, they had no impact on cardiovascular responses.

SS4.CIB.5 Effort learning, motivation and perseverance – neural mechanisms, pharmacological manipulation and clinical relevance

Jacqueline Scholl

University of Oxford

To make good decisions we have to trade-off rewards and costs such as effort. However, how rewarding and effortful actions actually are often has to be learnt over time from experience. We identified dorsal anterior cingulate for both trade-off decisions and learning. We then related these neural and behavioural mechanisms to clinical depression, a motivational disorder, and its commonly prescribed serotonergic treatment (SSRIs). We found that SSRIs strengthened learning signals for reward and effort and that this translated into improved learning. In a separate study we looked at sustained motivation (perseverance), again identifying dACC as well as perigenual ACC. We found that healthy people actually over-persevered. However, self-insight about this bias allowed some people to avoid situations in which it manifested. In a large population sample we further explored links between motivation, perseverance and insight and clinical factors related to motivational disorders such as apathy or depression.

SS4.ES

The Role of Reasoning in Moral Decision Making

Estambul Room

Chairs:

Indrajeet Patil
Harvard University, USA

Ivar Hannikainen
Pontifical Catholic University of Rio de Janeiro, Brazil

Owing largely to a pair of landmark publications (Greene, Sommerville, Nystrom, Darley, & Cohen, 2001; Haidt, 2001), research in moral psychology underwent a profound and lasting ‘affective revolution’. As a result, it is now widely believed that moral judgments result fundamentally from emotional processes. Through five distinct research programs, this symposium emphasizes the neglected role of rational deliberation in moral cognition: Patil reports neuroanatomical and behavioral evidence that domain-general reflectivity predicts utilitarian moral values. Hannikainen presents convergent cross-cultural evidence that reflection promotes, while rationalization undermines, utilitarian views about taboo behavior. In three further talks, Byrne, Buon and Bostyn demonstrate that moral evaluations—including punishment, wrongness and blame—are influenced by reasoning about causation, counterfactual possibilities, and effort. Thus, the symposium highlights the multifaceted relationship between reasoning and moral evaluation and calls for a more nuanced picture of the interplay between affect and reasoning processes in moral cognition.

Speakers:

Indrajeet Patil
Ivar Hannikainen
Ruth M.J. Byrne
Marine Buon
Dries Bostyn

SS4.EST.1 Reasoning supports utilitarian inclinations while resolving moral dilemmas

Indrajeet Patil

Harvard University, USA

Sacrificial moral dilemmas elicit a strong conflict between the choice of personally harming someone versus achieving the greater good, which is often called the “utilitarian” response. Although past research has argued that superior reasoning abilities and deliberative cognitive style is associated with endorsement of utilitarian solutions, this work suffers from several conceptual and methodological issues that leave open the possibility that utilitarian responses are due to reduced emotional response to harm. Across 8 studies, using self-report, behavioral performance, and neuroanatomical measures, we overcome limitations of the prior work and show that individual differences in reasoning ability and cognitive style of thinking are positively associated with a preference for utilitarian solutions, but bear no relationship with harm-relevant concerns. These findings support the dual process model of moral decision making and further underscore the utility of process dissociation methods.

SS4.EST.2 Rationalization and reflection differentially modulate prior attitudes toward the purity domain

Ivar Hannikainen

Pontifical Catholic University of Rio de Janeiro, Brazil

Outside Western, predominantly secular-liberal environments, norms restricting bodily and sexual conduct are widespread. Moralization in the so-called purity domain has been treated as evidence that some putative violations are victimless. However, respondents themselves disagree: They often report that private, yet indecent acts incur self-harm, or harm to one’s family and the wider community. In the present work, we distinguish two cognitive processes that could give rise to this link between harmfulness and immorality, and recreate them in a set of parallel experiments: We randomly assign Colombian and British participants to either reflect (decide whether acts are harmful and reconsider their initial moral judgments) or rationalize (decide whether acts are immoral and reconsider their initial harm beliefs). In both countries, reflection promoted opposition to unjust, but not impure, behavior. Additionally, in both countries, ruminating on the moral status of impure acts elevated beliefs in their harmfulness. Thus, discord surrounding putative violations of purity and decency appears to originate in intrinsically moral differences, rather than in factual disagreements about their harmfulness.

SS4.EST.3 Counterfactual thoughts in moral judgments

Ruth M.J. Byrne

University of Dublin, Ireland

People often think about how things could have or should have turned out differently and the counterfactual alternatives to reality that they create affect their moral judgments. For example, our experiments show that people more often judge that an agent should be punished when they imagine a counterfactual alternative in which an outcome would have been different if a harmful action had not been carried out. Our experiments also show that people more often judge that an agent should have acted in a self-sacrificial manner when they imagine a counterfactual alternative in which an outcome would have been different if such a noble act had not been carried out. We discuss the implications of the results for two conflicting theories: (1) the effect of counterfactual thoughts on moral judgments is evidence of a deliberative consideration of alternatives, (2) it is evidence of an intuitive, default representation of what is possible.

SS4.EST.4 Intent-based moral judgments and dual-processes models of moral cognition

Marine Buon

Paul Valéry University - Montpellier III, France

When making moral judgments, the agents' intentions and the harm they cause are two critical inputs that can act in concert (e.g., intentional harm) or in conflict (e.g., cases of accidental harms). How those factors are incorporated into moral judgment remains highly debated. In the present work, we will present a series of experimental studies using cognitive load manipulations to probe the deliberative versus intuitive basis of incorporating causation and intention into adult moral judgment. Unexpectedly, we found the integration of causation to be more resource- dependent than the integration of intentions. Moreover, results showed that the influence of cognitive load not only differ depending on the type of input but also depending on the type of moral judgments asked. Whereas wrongness judgments highly rely on available cognitive resources, punishment judgment do not. We will discuss these results in the light of the current available dual-processes models of moral cognition.

SS4.EST.5 The shape of blame

Dries Bostyn

University of Ghent, Belgium

While certain behaviors are undeniably praiseworthy (giving to charity) and others undeniably blameworthy (theft), there exists a class of behaviors for which blameworthiness and praiseworthiness is a function of how much of that behavior is done: e.g. spending time with your loved ones. These behaviors lie on a continuum in which part of the continuum is blameworthy (spending only a small amount of time with loved ones) and another part of the continuum is praiseworthy (spending a lot of time). In a set of four studies, we study how blame and praise change as a function of "effort". We uncover that the blame/praise curve is logistical in nature. Additionally, we estimate a neutral point for each behavior: the effort-level at which people are neither blamed nor praised. We find that this neutral point is related to what people think the average "effort level" is for that behavior.

SS4.ATE

Exploring Cognition Using New Technological Advances Such as Embodied Artificial Agents

Atenas Room

Chairs:

Agnieszka Wykowska
Francesca Ciardo
Italian Institute of Technology

The study of human cognition can benefit from rapid development of embodied artificial agents. The aim of this symposium is to highlight the crucial role that the use of embodied agents plays in modelling cognitive processes and in understanding human cognition. Using embodied artificial agents in interactive protocols to examine human cognition allows for excellent experimental control and, at the same time, ecological validity. Artificial agents allow for systematic manipulation of behavioural parameters in a controlled and modular way. They also allow for a higher ecological validity relative to screen-based stimuli, as embodied agents allow for investigating cognitive mechanisms during a real-time interaction with the environment. The use of embodied artificial agents in modelling cognition allows for novel insights into cognitive architectures. The speakers will cover a broad spectrum of topics in cognitive psychology ranging from human-robot interaction to modelling cognitive processes in an embodied system.

Speakers:

Emilie Caspar
Emily Cross
Jocelyne Ventre-Dominey
Pablo Lanillos
Tony J. Prescott

SS4.ATE.1 Asking robot to accomplish tasks: A threat for the human sense of agency?

Emilie Caspar

Netherlands Institute for Neurosciences; Université libre de Bruxelles

Feeling morally responsible for one's own action is nowadays considered as a key feature of humans; what distinguishes us from other mammals. However, the feeling of responsibility has been observed to be easily flickering, even totally abolished in some contexts, leading to dramatic consequences. Experimental studies have for instance shown that receiving orders from an authority appears to decrease the feelings of responsibility and agency of the executant, leading to harmful conducts towards others (Milgram, 1963; Caspar et al., 2016). The rise of robots in daily activities could add an additional complication for humans to experience responsibility: if a robot executes the action decided by a human, does the human feel responsible if things go wrong? In other word, does the actions of an entity with no own feeling of responsibility influence negatively or positively human sense of agency and responsibility?

SS4.ATE.2 Perceiving and Interacting with Artificial Agents: Insights from Social Neuroscience

Emily Cross

Bangor University; University of Glasgow

Understanding how we perceive and interact with others is a core challenge of social cognition research. This challenge is poised to intensify in importance as the ubiquity of artificial intelligence and the presence of robots in society grows. This talk examines how established theories and methods from psychology and neuroscience reveal fundamental aspects of how people perceive, interact with, and form social relationships with robots. Robots provide a resolutely new approach to studying brain and behavioural flexibility manifest by humans during social interaction. As machines, they deliver behaviours that can be perceived as "social", even though they are artificial agents and, as such, can be programmed to deliver perfectly determined and reproducible sets of actions. This talk highlights work bridging social cognition, neuroscience and robotics, with important implications not only for social robot design, but equally critically, for our understanding of the neurocognitive mechanisms supporting human social behaviour more generally.

SS4.ATE.3 Embodiment into a robot increases its social acceptability

Jocelyne Ventre Dominey

Université Claude Bernard Lyon 1

Here we used a simple neuroscience-inspired procedure for teleporting a human subject into a robot. Participants wore a Head Mounted Display (HMD) tracking their head movements and displaying the 3D stereo visual scene taken from the eyes of the robot, which was positioned in front of a mirror. As a result, participants saw themselves as robots. Interactive visuo-tactile or visuo-motor stimulation created subjects' illusion of embodiment into the robot in multiple dimensions and intensities depending on the type of stimulation. Critically, participants judged the robot as significantly more likeable and socially closer after the teleportation experience. This embodiment experience and social acceptability increase was largely independent of the robot's humanoid vs. cartoon-like appearance. These findings reveal that embodiment into robots that do not share any clear human resemblance is possible, and also pave a new way to make our future robotic helpers socially acceptable.

SS4.ATE.4 Body-illusions in humans and robots: computational models for body perception

Pablo Lanillos

Technische Universität München

Body-illusions are a window to understand how we perceive our bodily self. Despite of the effort to understand the mechanisms behind body on-line adaptation and multisensory integration, just a few computational models have been able to explain some of the effects. I will present body inference by means of prediction error minimization as the mechanism responsible of the perceptual changes when we are subjected to sensory conflicts. Using the rubber-hand illusion experiment, I will analyse predictive coding and Bayesian causal inference approaches to model proprioceptive and visual drift, and their implications for unconscious active body estimation. To validate these models we used multisensory humanoid robots, allowing us to replicate the first artificial rubber hand illusion, and illustrating how robots can be used to test theoretical models. Finally, I will describe, under SELFCEPTION project, how the proposed model lays the foundation of the sensorimotor self-computational model.

SS4.ATE.5 The synthetic psychology of the self

Tony J. Prescott

The University of Sheffield and Sheffield Robotics

Synthetic psychology describes the approach of “understanding through building” applied to the human condition. In this talk I will consider the specific challenge of synthesizing a robot “sense of self”. The starting hypothesis is that the human self is brought into being by the activity of a set of transient self-processes instantiated by the brain and body. I propose that we can synthesize a robot self by developing equivalent sub-systems within an integrated biomimetic cognitive architecture for a humanoid robot. The talk will describe efforts to create a sense of self for the iCub humanoid robot that has ecological, temporally-extended, interpersonal and narrative components set within a multi-layered model of mind.

SS4.StT
Current Topics in Music Cognition: Perceiving Time and Structure

Saint Tropez Room

Chairs:

Tudor Popescu
Medical University of Vienna, Austria

Jonna Vuoskoski
University of Oslo, Norway

The human mind has a remarkable propensity for finding structure and grouping rules in the environment. In recent years, advances have been made in understanding the crucial role of predictive (top-down) processes. Due to its highly organised nature, music provides an ideal setting for studying such processes as they unfold. Rhythm is a fundamental structuring mechanism for music, and its syntax at different time scales (e.g. note- or phrase-level) lends itself to hierarchical modelling. This symposium brings together contributions – spanning behavioural, neuroimaging and computational approaches – that aim to understand how various structuring and organising mechanisms operate in music perception, how top-down models are acquired, and whether such processes can be generalised to other domains such as language and motor synchronisation. Music cognition has been steadily growing in terms of publications, endowments and public attention. We thus expect this symposium to generate a good attendance and lively discussions.

Speakers:

Michelle Phillips
Tudor Popescu
Martin Rohrmeier
Jonna Vuoskoski
Sonja Kotz

SS4.StT.1 New models of psychological time are needed to account for structural coherency of events

Michelle Phillips

Royal Northern College of Music, UK

Music, which usually consists of highly organised and structurally coherent information, offers an opportunity to study the effect of the structure of events on perception of time elapsed. Prospective models of psychological time prioritise processes of attention (e.g. the attentional gate model), whilst retrospective theories focus primarily on memory (e.g. the contextual change model). However, none of the existing frameworks adequately take account of the structure of events contained in the duration in question. This paper will outline a series of studies which examine the effect of structural coherence of events in music and speech on perception of elapsed duration. Whilst also taking account of factors known to effect experience of duration during music listening - sense of enjoyment, familiarity, closure, and individual differences - these experiments suggest a need for models of psychological time to account for the structure of the events themselves.

SS4.StT.2 Perceiving boundaries: an Indian music segmentation study

Tudor Popescu

Medical University of Vienna, Austria

The degree to which unfamiliar music appears to “make sense” to listeners indicates listeners are able to perceive inherent structural features of music, at least implicitly. One aspect to which they may be sensitive is segmentation, and a number of studies suggest listeners rely on surface features, such as durational separation, as markers of segment boundaries. Only few segmentation studies exist based on non-Western music, but these indicate that Western listeners, both musicians and non-musicians, have some awareness of segment boundaries in unfamiliar Middle Eastern music, although less than enculturated musicians. Here we asked Western subjects to indicate phrase boundaries while listening to Indian music of two different rāga grammars. Results suggest significant convergence between subjects’ perceptions and expert segmentation; and significant recognition of a grouping hierarchy. We will discuss how far subjects may be aware of deep structural features, and how far performers articulate deep structure through surface cues.

SS4.StT.3 Exploring musical syntax: bridging theory and experimental approaches

Martin Rohrmeier

Ecole Polytechnique Federale de Lausanne (EPFL), Switzerland

In this contribution, a novel theory of musical rhythm will be presented. While related components such as metrical structure and grouping have been formally modelled in previous work, most prominently by Lerdahl & Jackendoff (1983) and London (2012), the structure of rhythm and its modelling has received comparably little attention. In this proposal, musical rhythm is modelled by a formal, generative model that operates on temporal segments and events, and employs syntactic primitives such as temporal split, shift, event preparation and hiding. Through the recursive application of such principles, such a model can capture relations of rhythmic intentionality, the deep structure behind phenomena like syncopations and groove, as well as model the interfaces to metrical and grouping/phrase structure. The resulting model lends itself to computational implementation and exploration, and also casts predictions for psychological investigations.

SS4.StT.4 Parallels between the cognition of rhythm in sports and music

Jonna Vuoskoski

University of Oslo, Norway

Although rhythm is often discussed in purely auditory terms, mounting evidence from the fields of cognitive psychology and neuroscience suggests that rhythm is fundamentally a domain-general phenomenon grounded in motor action. By drawing parallels between music and rowing – a sport characterized by repetitive rhythmic patterns and synchronized joint action – I illustrate how biological motion principles underlie the parameters of rhythm in both disciplines, and how interpersonal synchronization relies on shared timing models, multisensory cues, and predictive processes. Furthermore, I will demonstrate how conceptual and theoretical tools developed in the context of musical rhythm – such as non- isochronous meter (i.e., a cyclic pattern of beats with unequal durations) – can contribute to conceptualizing and understanding rhythm cognition in the context of rowing as well. Finally, I will discuss how accurate sensorimotor synchronization can facilitate experiences of ‘flow’ in both disciplines – especially in the face of increasing rhythmic complexity.

SS4.StT.5 Brain dynamics of rhythm and speech perception

Sonja Kotz

University of Maastricht, Netherlands

The influence of time and rhythm in music is clearly recognized but is less clear in speech processing (see Kotz & Schwartz, 2010). This is surprising as time and rhythm (i) play a significant role in speech and language learning, (ii) can compensate developmental and acquired speech and language disorders, and (iii) further our understanding of subcortical contributions to linguistic and non-linguistic functions. More specifically, recent neuroimaging and clinical evidence confirmed the engagement of motor control areas (cerebellum, basal ganglia, supplementary motor area) in cross-domain rhythm perception (Chen et al., 2008; Grahn et al., 2007; Geiser et al., 2009; Kotz et al., 2009; Kotz & Schwartz, 2011). I will present evidence on the role of timing and rhythm in speech and music and discuss results within a cortico-subcortical framework of cross-domain rhythm perception.

SS4.TAR**Don't Forget to Take Your Medication when Cooking Dinner: How Are Working Memory and Prospective Memory Related?*****Tarraco Room***

Chairs:

Alexandra Hering

Evie Vergauwe

University of Geneva, Switzerland

Imagine that you have to remember a phone number for a few seconds. Now imagine that you need to remember to post a letter after work. Both situations require that some information is maintained in memory for some time. Despite the similarity of the two situations, the cognitive ability in the first situation is often referred to as working memory (i.e., our ability to remember information over brief periods of time), whereas the cognitive ability in the second situation is often referred to as prospective memory (i.e., our ability to remember to carry out future intentions). Working memory and prospective memory have been intensely studied, but without much cross-talk between these subfields of cognitive psychology. Here, we propose to bridge this gap by giving an overview of recent studies that are concerned with the interplay of working memory and prospective memory, including both working memory and prospective memory researchers.

Speakers:

Alexandra Hering

Nathan Rose

Jan Rummel

YuHo Vanessa Wong

Christian N.L. Olivers

Discussant: Matthias Kliegel

SS4.TAR.1 Do prospective memory and working memory share the same attentional resources?

Alexandra Hering, Naomi Langerock, & Evie Vergauwe

University of Geneva

The aim of the present study was to investigate if and how prospective memory (PM) and working memory (WM) share attentional resources. Participants worked on a complex span task, in which they memorized locations while deciding if a line fits between two squares. Hundred-seven younger adults were assigned to three groups: (1) performing only the complex span task, (2) performing the task with an additional PM task to maintain and (3) performing the complex span task with an online instruction for the PM task without maintaining it. The results revealed that the two groups with the PM task (load or online) performed worse compared to a baseline, whereas the control group did not differ. The two groups with PM instruction did not differ in their performance, indicating that the maintaining of a PM instruction did not affect WM. However, the execution of an additional PM task reduced WM resources.

SS4.TAR.2 The association between age and individual differences in prospective memory and working memory depends on task context: Evidence from performance in real and virtual environments

Nathan Ros

University of Notre Dame

A correlation between age and individual differences in prospective memory (PM) and working memory (WM) is intuitive, but the strength of this association is quite variable across the literature. In this talk, I'll review the roles of several moderating factors of the association, including cue-type, task-regularity, measurement reliability, and task-context, which reveals a pattern of age differences in PM across laboratory and naturalistic settings that has been called "paradoxical". Recent research using parallel task designs across task-contexts and immersive virtual reality technology points to factors that modulate the extent to which maintenance and monitoring processes are required for successful PM performance as the underlying source of associations with age and individual differences in WM. The overall pattern previously deemed paradoxical can be interpreted according to principles of neurocognitive development and the dynamic multiprocess model of PM.

SS4.TAR.3 PM-related attentional decoupling can tax working memory but can be beneficial for prospective memory

Jan Rummel

University of Heidelberg

A core assumption of some working-memory (WM) theories is that the amount of information that people are able to simultaneously maintain in their focus of attention is limited (e.g., Cowan, 1988). This WM limit seems also relevant for prospective memory (PM) because to not forget a pending PM task it is often crucial to devote some attention to it. PM-related attentional decoupling, however, often comes at a cost to currently ongoing tasks and thus should be kept to a minimum necessary for PM to succeed. Results from three experiments will be provided showing that (1) PM-related attentional decoupling is beneficial for PM, (2) PM-related attentional decoupling is more efficient when being adjusted to PM-relevant contexts, and (3) that people with better executive control abilities better adjust their PM-thoughts. These findings imply that WM and PM rely on similar processes but that their interrelations may be more complex than hitherto assumed.

SS4.TAR.4 Effects of acute stress on prospective memory as a function of working memory load and stress appraisal

YuHo Vanessa Wong & Katharina Schnitzspahn

University of Aberdeen

Stress is ubiquitous in everyday life and impairs prefrontal cortex activities. Surprisingly, prior studies found no stress effects on prospective memory which relies on prefrontal activities. After reviewing the literature on stress effects on working memory and the biopsychosocial model of challenge and threat, we suggest that the absent stress effects could be explained by the use of simple prospective memory tasks with low working memory requirements and the individual appraisal differences of the stress induction. The present study randomly assigned 138 young adults to one of three conditions: a challenge or a threat condition via manipulation of a psychosocial stressor and a control condition. Subsequently, they completed a demanding prospective memory task with varying working memory load (low vs high). Preliminary results indicated a successful stress induction and that high working memory load impaired prospective memory as expected. Effects of stress on prospective memory will be discussed.

SS4.TAR.5 Prospective working memory

Christian N.L. Olivers

Vrije Universiteit Amsterdam

Recent years have seen an accumulation of evidence for different states of representation within working memory, depending on whether a representation serves current or prospective behavioural goals. I will review studies from our lab in which we induced such state changes through cueing or through task structure, and show how the different memories can be dissociated with neurophysiological measures, including ERPs, time frequency measures, and multivariate pattern decoding. Moreover, I will provide evidence that prospective memories stored in long-term memory can be better shielded from current tasks than prospective memories stored in working memory, suggesting that plans for the long run are stored differently from plans for the short run.

SS4.BAR

Experimental Approaches to Reading Acquisition

Barcelona Room

Chairs:

Sarolta Bakos

Xenia Schmalz

University Hospital Munich, Germany

The aim of this symposium is to examine which factors contribute to reading acquisition. One approach to answer this question is to model reading acquisition with an artificial learning paradigm (talk 1). Statistical mechanisms of visual word and artificial lexicon learning (talk 2), and the statistical knowledge about orthographic regularities might also play a role (talk 3). Furthermore, to better understand cognitive and neurophysiological factors contributing to reading, the symposium evaluates an early risk-identification in first grade via reading speed and traces the development of reading, spelling and related cognitive factors until fourth grade (talk 4) and examines orthographic processes during reading and spelling in an electroencephalogram study (talk 5). The talks converge in describing experimental and observational studies aiming to understand the cognitive processes that are necessary for reading acquisition.

Speakers:

Xenia Schmalz

Davide Crepaldi

Kemény Ferenc

Susanne Volkmer

Sarolta Bakos

SS4.BAR.1 Item- and participant-level factors affecting Artificial Orthography Learning

Xenia Schmalz, Gerd Schulte-Körne, & Kristina Moll

University Hospital Munich, Germany

We aimed to test whether Artificial Orthography Learning (AOL) is a viable experimental paradigm to model reading acquisition in children. First, to measure participant-level differences, learning performance should capture a stable participant characteristic: when the same participants learn two orthographies, their performance should correlate. Second, if AOL mimics the process of reading acquisition, we expect a correlation between learning performance and reading ability. Third, performance should not merely reflect the ability to memorise arbitrary symbol-sound associations, resulting in weak correlations between performance on the AOL and Paired Associate Learning (PAL) tasks. We tested 70 adult participants on two AOL tasks, reading ability, and a PAL task. We found high correlations between learning of the two AOL tasks, suggesting that performance captures a stable individual characteristic. Correlations with reading ability and PAL were low, suggesting that AOL is dissociable from reading ability and from the ability to memorise arbitrary symbol-sound associations.

SS4.BAR.2 The Statistical Mechanics of Lexical Learning and Visual Word Identification

Davide Crepaldi

International School for Advanced Studies (SISSA), Trieste

Humans are incredibly efficient readers despite having no biological endowment for visual word processing. I will contend that this depends on our ability to track regularities in the co-occurrence of word parts, such as letters and morphemes. This would allow us to form a “lexical theory”—how words look like and carry meaning in a given language—rather than a collection of individual word memories. I will substantiate this claim with evidence from a set of artificial lexicon experiments, where we explored the statistical mechanisms that might support visual word identification and learning. In particular, we investigated: (i) the role of letter transitional probability; (ii) lexical diversity (type/token ratio); (iii) position coding; and (iv) the strength of the statistical evidence that is necessary to promote effective learning.

SS4.BAR.3 Predicting the next letter – does general orthographic knowledge contribute to reading?

Ferenc Kemény

University of Graz, Graz, Austria

Reading is a rich source of statistical information: there are more and less frequent letter clusters. The current research aims to identifying whether and how adults and children identify and utilize predictive information during reading. The current study used direct and indirect assessments of general orthographic knowledge with adults and children (aged 7-9). In a direct assessment, participants had to directly compare bigrams by frequency. In an indirect test, participants were exposed to bigrams, and had to press a response key if the bigram contained a predefined letter. Both direct and indirect tests demonstrated knowledge of orthographic regularities: indicated by a preference to choose high frequency clusters in the direct test and by shorter RTs for target letters in high frequency clusters during the indirect test. Measures, however, do not explain variance in reading skills. Thus, we demonstrate knowledge of sublexical regularities, but their contribution to reading is not clear.

SS4.BAR.4 Identification of at-risk readers in first grade: A three-year longitudinal study

Susanne Volkmer, Gerd Schulte-Körne, & Katharina Galuschka

University Hospital Munich, Germany

Early identification of reading difficulties is crucial to enable effective early intervention. The aim of the present longitudinal study was to test whether school-based risk identification of reading disorder (RD) is already possible in first grade. We screened reading speed of 234 children at midterm of first grade and classified those below the 30th percentile as at risk of RD. Follow-up-testings were conducted at the end of first grade, in second and in fourth grade. In addition to reading ability, spelling, morphological and phonological awareness were screened. The results show that the short risk screening at midterm of first grade was reliable. It did not only predict RD but also spelling disorder in second and fourth grade. The identified at-risk children also performed poorer in morphological and phonological awareness in the follow-up-testings. The study is an important step towards class-wide risk identification, which is essential for a possible prevention of RD.

SS4.BAR.5 Neurophysiological underpinnings of orthographic processing depth: A comparison between word recognition and written word production

Sarolta Bakos, Gerd Schulte-Körne, & Kristina Moll

University Hospital Munich, Germany

There is still an ongoing debate whether orthographic processes are shared between reading and spelling. To answer this question, we will compare the electrophysiology of auditory word processing in different task settings in an EEG experiment. After listening to a word stimulus, participating 9-10-year-old children ($N \sim 40$) will be asked to either spell the heard word (word production/spelling task), to compare it to a visually presented word (word recognition/passive reading task), or to make judgement whether the visually presented word is spelled correctly (lexical decision task). Data are currently being collected and analysed. Based on previous results in adult participants, we expect higher N1 and P2 amplitudes in the spelling than in the reading tasks, reflecting attentional processes. Furthermore, we expect distinctively more negative N400 and more positive LPC (late positive complex) in the lexical decision and spelling tasks compared to the passive reading task, reflecting deeper orthographic processing.

SS4.PAL**The Origins and Consequences of Monitoring Processes in Human Action Control*****Palma de Mallorca Room***

Chair:

Christina Pfeuffer

University of Freiburg, Freiburg, Germany

Various monitoring processes are assumed in different areas of Psychology. Often, these monitoring processes fill explanatory gaps and their nature is cause for ongoing debates. In this symposium, we aim to explore the origins of monitoring processes occurring in human goal-directed action control and we discuss the consequences they have. First, we examine monitoring processes that occur while we anticipate the predictable consequences of our actions. Then, we turn to monitoring processes that occur when such action consequences indicate errors and suggest a need for behavioral adaptations. Subsequently, we address the sense of agency as a potential consequence of such monitoring processes. Finally, we discuss metacontrol states as a case of higher order monitoring processes in human action control. Thus, we portray monitoring from monitoring during initial action planning to action evaluation as well as, on a more global level, across various actions.

Speakers:

Christina Pfeuffer

Stefanie Ochsenkühn

Hannah Dames

Mark Schram Christensen

Bernhard Hommel

SS4.PAL.1 On the proactive monitoring of future action consequences and its coupling with effect-generating actions

Christina Pfeuffer & Andrea Kiesel

University of Freiburg, Freiburg, Germany

Our eyes often saccade towards locations we expect the consequences of our actions to appear at. Such spontaneous anticipatory saccades are guided by bi-directional associations between action and effect and presumably reflect a proactive monitoring process that prepares a later comparison of expected and actual effect. Here, participants' manual left/right keypresses predicted the location and timing of visual effects. The latency of anticipatory saccades was shorter for short rather than long action-effect delays, indicating that not only the location of the effects, but also their temporal delay was anticipated and proactively monitored. Furthermore, anticipatory saccades occurred later when manual actions were delayed, suggesting that manual action preparation had to be largely completed for anticipatory saccades to emerge. Thus, interactions of action selection and proactive effect monitoring make human action control highly effective by allowing for adaptations in proactive monitoring until the manual action and thus its effects are imminent.

SS4.PAL.2 Neural evidence for hierarchical error monitoring in dual-tasking

Stefanie Ochsenkühn, Robert Steinhauser, & Marco Steinhauser

Catholic University of Eichstätt-Ingolstadt, Eichstätt, Germany

Recent studies indicate that when two distinct tasks are processed concurrently, they are represented in a hierarchical structure. This structure encompasses distinct subtask sets as well as a superordinate dual-task set, which contains, amongst others, information about the task order. Our goal is to investigate whether error monitoring mirrors this hierarchical task-set structure. In a first study we examined whether the error monitoring system elicits independent error signals when errors occur in two subtask sets simultaneously. In a second study, we took advantage of the fact that dual-tasking situations allow for a type of error that solely affects the superordinate dual-task set and cannot occur in single-task paradigms. To this end, we measured correlates of error monitoring in order reversals, in which the individual subtasks are executed correctly but in the wrong order. Our results point towards a hierarchical structure of error monitoring in dual-tasking.

SS4.PAL.3 Anticipatory saccades reveal increased proactive monitoring in post-error trials

Hannah Dames & Christina Pfeuffer

University of Freiburg, Freiburg, Germany

When the consequences of our actions are predictable, we often look towards the location at which our actions' effects will appear. Here, we examined how this proactive monitoring process is affected by errors. We conducted an eye tracking experiment in which participants' manual forced-choice responses triggered visual effects. The location of these effects predictably depended upon the current spatial compatibility between participants' actions and their effects (horizontal dimension) and on response correctness (vertical dimension). Participants showed typical post-error adaptations in manual responses, that is, a distinct post-error slowing (PES) and increased-accuracy (PIA) effect. Interestingly, we also found post-error adaptations in participants' anticipatory saccades. Our generalized linear mixed model indicated a greater likelihood of saccades towards the future location of the effect rather than away from it following errors. Importantly, this enhanced effect monitoring post-error occurred mostly for the vertical effect dimension reflecting participants' expectations regarding their responses' correctness.

SS4.PAL.4 Sense of agency for movements

Mark Schram Christensen & Thor Grünbaum

University of Copenhagen, Copenhagen, Denmark

Sense of agency has been suggested to play an important role in motor control and motor cognition. We will present three arguments concerning sense of agency. First, we present an operational model of agency classifying agency along two dimensions: Agency can be seen as an ability or a phenomenal experience. Agency can concern actual body movements (narrow agency) or incorporate external consequences in the world (broad agency). Most studies are performed on broad sense of agency. Secondly, we present data, which suggests that narrow agency cannot adequately be explained by the influential comparator model but may rather be explained by a motor signal model. Finally, we provide an analysis of the construct validity of sense of agency and provide suggestions on how to improve construct validity of agency studies in the future with a focus on alignment between choice of experimental procedures and phenomenon to explain.

SS4.PAL.5 The Yin and Yang of cognitive control

Bernhard Hommel

University of Leiden, Leiden, Netherlands

Traditional approaches to action control assume the existence of a more or less unitary control system that struggles with, and serves to overcome action tendencies induced by automatic processes, but these approaches fail to capture the complexity and dynamics of cognitive control. I describe an alternative approach that assumes that control emerges from the interaction of at least two counteracting forces: one system promoting persistence and the maintenance of action goals and another promoting mental and behavioral flexibility. I describe how this interaction might be shaped by various factors, including genetic predisposition, learning, personal experience, and the cultural context, and suggest a simple functional model (the Metacontrol State Model, MSM) that explains how this shaping process works. Then I provide an overview of studies from various fields (including perception, attention, performance monitoring, conflict resolution, creativity, meditation, religion, and social cognition/behavior) that successfully tested predictions from the MSM.

SYMPOSIUM SESSION 5

Saturday 28th

14:30-16:10

SS5.AUD**Theories and Models of Human Intelligence: Recent Developments**

Psychonomic Society Collaborative Symposium

Auditorio*Chair:**Andrew R.A. Conway
Claremont Graduate University*

For almost a century, the field of human intelligence has developed independently of mainstream experimental/cognitive psychology, resulting in what Cronbach famously identified as a separation of the two disciplines of scientific psychology: correlational and experimental. Relatedly, research on intelligence had been dominated by taxonomies rather than cognitive models. The beginning of the 21st century has seen a drastic change; the field of intelligence suddenly proliferated in theories and models that integrate results from the study of the cognition and the neural bases of cognitive processes in order to explain core phenomena in the individual differences literature. Such recent advances include the mutualism model (van der Maas et al., 2006), process overlap theory (Kovacs & Conway, 2016), the watershed model (Kievit et al., 2016), and network neuroscience theory (Barbey, 2017). According to these models, the general factor of intelligence is not a psychological attribute; instead, it is an emergent property of dynamic cognitive and neural networks. At the same time, research on one of the oldest topics in intelligence, mental speed, has gained momentum from methodological improvements (Schubert et al., 2015). The proposed symposium will bring together an international group of researchers who are all actively working on theories and models of human intelligence. These models integrate findings from psychometrics, neuroscience, and cognitive psychology. The speakers will present models and theories they have developed as well as the state of the art of research motivated by these models and theories.

Speakers:

Han L. J. van der Maas
Kristof Kovács
Anna-Lena Schubert
Rogier A. Kievit
Aaron K. Barbey

SS5.AUD.1 The network approach to general intelligence

Han L. J. van der Maas, & Kees-Jan Kan

University of Amsterdam, The Netherlands

The study of individual differences in cognitive performance or 'intelligence' is a multidisciplinary endeavor, integrating results from both psychometric and non-psychometric research, including genetics, neuroscience, and education. Intelligence remains a puzzling concept, however. After more than a century of research, there is still no consensus on the definition of intelligence, for example, and there are still major disputes over whether intelligence is one thing (a general ability) or multiple things. In our view, it is important to arrive at a clear conception of what intelligence is. In this presentation we adhere to such a conception and present a formal model of psychometric intelligence. This model is admittedly overly simplistic, yet illuminates mechanisms that can explain some important, and well replicated phenomena in the study of intelligence. The model firstly acknowledges that the brain is a complex system, i.e., an open system consisting of many elements that interact non-linearly. Secondly, intelligence is regarded as an emergent phenomenon of that system, a phenomenon that results from intricate local interactions among those elements. In short, the model provides an alternative explanation of the positive correlations between cognitive tests, based on the idea of networks: a key modeling framework within complex system research. In this presentation, we will a) explain the origin and setup of this so-called mutualism model, b) discuss criticisms that have been raised in response to the model, c) extend the model, d) present new statistical techniques for this model, and e) discuss new developments in the network modeling of general intelligence.

SS5.AUD.2 Process overlap theory: A cognitive explanation of the structure of human mental abilities

Kristof Kovács¹ & Andrew R.A. Conway²

1. *ELTE Eotvos Lorand University, Budapest, Hungary*

2. *Claremont Graduate University, Claremont, CA, USA*

People who perform better on one kind of mental test tend to perform better on other tests as well. This result is called the positive manifold and is described with a general factor, 'g'. g, in turn, is often identified with a domain-general, within-individual cognitive mechanism. This interpretation does not sit well with findings from cognitive psychology and neuroscience that point to the domain-specific fractionation of cognition. We recently proposed an alternative explanation, process overlap theory, a cognitive theory of overlapping item response processes. The theory assumes that any item requires a number of domain-specific as well as domain-general cognitive processes and their corresponding neural mechanisms. Domain-general processes involved in executive attention are central to test performance. That is, they are activated by a large number of test items, alongside with domain-specific processes tapped by specific types of tests only. Such an overlap of executive processes explains the positive manifold as well as the hierarchical structure of cognitive abilities. The theory also accounts for a number of other, previously unexplained phenomena in differential psychology, such as the central role of fluid inductive reasoning in cognitive abilities or the higher across-domain variance in low ability groups (differentiation). Besides presenting the theory and the corresponding multidimensional item response model, recent and ongoing studies testing predictions of the theory will be discussed: 1) an analysis of differentiation in working memory capacity, 2) a simulation study of test performance based on the model, 3) a network analysis of the Wechsler scales.

SS5.AUD.3 A Process-based account of the relationship between mental speed and mental abilities

Anna-Lena Schubert¹, D. Hagemann¹, & G. T. Frischkorn^{1,2}

1. *Heidelberg University, Heidelberg, Germany*

2. *University of Zurich, Zurich, Switzerland*

Individual differences in the speed of information processing have been shown to be consistently related to individual differences in general intelligence. It is an open debate whether these associations can be explained in terms of individual differences in some brain-wide property affecting a large number of cognitive processes, or whether these advantages in processing speed reflect advantages in specific cognitive processes such as executive functions or evidence accumulation. We will demonstrate how mathematical models and psychophysiological approaches can be used to shed some light onto these questions by decomposing the time-course of information processing and relating process parameters to cognitive abilities. In particular, we will present recent research showing that more intelligent individuals show specific advantages in the speed of higher-order cognitive processes such as decision making and memory updating. Moreover, we will present results from two studies suggesting that the association between processing speed and general intelligence may be driven by a confounding variable and discuss whether structural or functional brain network connectivity may be a candidate confound explaining the association between mental speed and mental abilities. Finally, we will outline a research agenda that combines mathematical modeling and psychophysiological approaches to identify the neuro-cognitive processes giving rise to individual differences in general intelligence.

SS5.AUD.4 A watershed model of fluid intelligence: Evidence from 3 lifespan cohorts

Rogier A. Kievit

University of Cambridge, Cambridge, UK

Fluid intelligence is a crucial cognitive ability that predicts key life outcomes across the lifespan. Strong empirical links exist between fluid intelligence and processing speed on the one hand, and white matter integrity and processing speed on the other. We propose a watershed model that integrates three explanatory levels in a principled manner in a single statistical model, with processing speed and working memory figuring as intermediate phenotypes between white matter microstructure and fluid abilities. Using a hierarchical structural equation model we fit this model in a large (N=555) adult lifespan (18-88) cohort from the Cambridge Centre for Ageing and Neuroscience (Cam-CAN) using multiple measures of processing speed, white matter health and fluid intelligence. We then replicated and expanded the watershed model in two developmental two cohorts: CALM (N = 551, aged 5 - 17 years) and NKI-RS (N = 335, aged 6 - 17 years). In all three samples, the watershed model fit the data well, outperforming competing accounts and providing evidence for a many-to-one mapping between white matter integrity, processing speed, working memory and fluid intelligence. Moreover, using exploratory SEM trees in the developmental cohorts, we observed that the relationship between cognitive abilities and white matter differed with age, showing a dip in strength around ages 7 - 12 years. This age-effect may reflect a reorganization of the neurocognitive architecture around pre- and early puberty.

SS5.AUD.5 Network neuroscience theory of human intelligence

Aaron K. Barbey

University of Illinois, Urbana-Champaign, IL, USA

An enduring aim of research in the psychological and brain sciences is to understand the nature of individual differences in human intelligence, examining the stunning breadth and diversity of intellectual abilities and the remarkable neurobiological mechanisms from which they arise. In this presentation, I survey recent neuroscience evidence to elucidate how general intelligence (g) emerges from individual differences in the network architecture of the human brain. The reviewed findings motivate new insights about how network topology and dynamics account for individual differences in g, represented by the Network Neuroscience Theory. According to this framework, g emerges from the small-world topology of brain networks and the dynamic reorganization of its community structure in the service of system-wide flexibility and adaptation. Rather than attribute individual differences in general intelligence to a single brain region, network, or the overlap among specific networks, the proposed theory instead suggests that general intelligence depends on the dynamic reorganization of brain networks - modifying their topology and community structure in the service of system-wide flexibility and adaptation. This framework sets the stage for new approaches to understanding individual differences in general intelligence, examining the global network topology and dynamics of the human brain - from the level of molecules and synapses to neural circuits, networks, and systems. By investigating the foundations of general intelligence in global network dynamics, the burgeoning field of network neuroscience will continue to advance our understanding of the cognitive and neural architecture from which the remarkable constellation of individual differences in human intelligence emerge.

SS5.CIB
Probing the Mind with Magic

Cibeles Room

Chairs:

Susana Martínez-Conde

Stephen L. Macknik

State University of New York, Downstate Medical Center

Magic is one of the oldest art forms, and magicians have manipulated audiences' perceptual and cognitive processes for much longer than scientists have. Thus, magic illusions provide scientists with methodological refinements and testable hypotheses about the building blocks of perception and cognition. Indeed, the last decade of research in cognitive psychology has seen a rapidly growing consensus concerning the value of magic performances as a rich and largely untapped source of insight into human cognitive mechanisms. Here we will present the most recent approaches to the study of magic from a cognitive science perspective. Lectures will provide a wide overview of how magic performances can be harnessed to study sudden insights in problem solving, the importance of emotional engagement in magic misdirection, the impact of narrative on the magic experience, the use of mentalism magic in introspection and agency research, and the ecological validity of magic in social contexts.

Speakers:

Luis Martínez

Stephen L. Macknik

Susana Martínez-Conde

Petter Johansson

Amory H. Danek

SS5.CIB.1 Magic in a jar?

Luis M. Martínez, David Sánchez-Bestué, & Jordi Camí

Spanish National Research Council (CSIC); Universidad Miguel Hernández, Spain

Magic is probably the art that takes most advantage of social context. Can the results of a magic experiment, as studied in the laboratory, be extrapolated to more ecological conditions, such as magic on the street or onstage? We will discuss the results of two different experiments based on (1) classical and psychological forcing, and (2) change and inattention blindness in the Princess Card Trick showing that, in fact, the magic in the laboratory behaves in a similar way to other classic cognitive experiments and in a very different way to how it is perceived live and direct. It is necessary, then, to demonstrate that the same phenomena that we observe in the laboratory happen equally in situations typical of daily life. Magic appeals to us as the ideal complement to neuroscience and sociology to advance our knowledge about how we think, make decisions and act in ecologically relevant situations.

SS5.CIB.2 Impact of positive and negative emotion on the detection of continuity errors

Stephen L. Macknik, Francisco Costela, Leandro Di Stasi, Pamela Osborn, Carolyn Posey, Jorge Otero-Millan, Hector Rieiro, & Susana Martínez-Conde

State University of New York, USA

Magicians use emotions, particularly mirth, as a powerful way to manipulate attention during performances. Here we built a database of 135 edited video clips, extracted from horror and comedy Hollywood movies, and edited each clip will to contain an average of 12 continuity errors distributed across the total duration of the clip. Three types of photorealistic continuity errors were introduced, consisting of appearance/disappearance, color, and enlargement/shrinking. Subjects were tasked with finding the continuity errors while engaging with the content of each clip. Our results illustrate how positive (mirth) and negative (fear) emotions affect detection of, and attention to, continuity errors as a function of emotional intensity, valence, and timing. These findings have implications for the mechanisms of attentional misdirection during magic performances, and for the interaction of emotion and attention in everyday life.

SS5.CIB.3 Narrative and the perception of magic tricks

Susana Martínez-Conde, Robert G. Alexander, Arthur Nguyen, Seung Baang, Jordi Chanovas, Ashwin Venkatakrishnan, Sofya Gindina, Adriana Nozima, Benjamin Altschuler, & Stephen L. Macknik

State University of New York, USA

Magic performances offer exciting scenarios with which researchers can probe the effects of narrative on perception and cognition. Magicians use “patter” to manipulate and misdirect an audience’s attention during performances, and even affect the future recall of spectators. Here, we will present recent research in which we have combined different narratives with videotaped as well as live magic performances. Performances were presented in a laboratory setting and carefully controlled so as to maintain sleight-of-hand techniques constant while providing varying narratives. This setup allowed us to explore the magic performance equivalents to ‘choice blindness’ (i.e. with the magician “forcing” apparently free decisions on a spectator) and ‘change blindness’ (i.e. with the magician displaying visible stimuli that went unnoticed by observers).

SS5.CIB.4 Exploring the mind through mentalism

Thomas Strandberg, Jay Olson, Lars Hall, & Petter Johansson

Lund University, Sweden

In this presentation we will discuss the use of mentalism magic to explore the nature of introspection and agency. What would happen to human interactions if brain scanning became sufficiently advanced to accurately read the minds of people? How would we feel and behave if our minds were fully transparent to others? We have simulated this highly interesting scenario by the use of mentalism, providing participants in (mock) brain scanners detailed (fake) predictions about their thoughts, beliefs and attitudes, and explored how this influences their future behavior.

SS5.CIB.5 Magic as a task domain for insight problem solving

Amory H. Danek

Heidelberg University, Germany

Sometimes, creative, new solutions to difficult problems simply pop into mind. The question of how such sudden insights occur has puzzled researchers for nearly one century, but still remains unsolved. Broadening the traditional approach to insight research, we propose to exploit the potential of a new task domain: Magic tricks. We developed a set of 35 video stimuli with short visual magic effects performed by a professional magician. Participants' task is to find a plausible solution how the magic effect can be achieved, i.e. to discover the magician's secret method. We argue that magic tricks are ideally suited to investigate the conceptual change underlying sudden insights and present some examples for their successful use in different experimental paradigms related to problem solving.

SS5. EST**Communication Systems Across Species: How Research on Animals Inspires Research on Humans*****Estambul Room***

Chairs:

Clara D. Martín

BCBL, San Sebastian, Spain

Constance Scharff

Freie Universität Berlin, Germany

The aim of this symposium is to highlight how research on human cognition can benefit from research on animal cognition. For years, researchers have looked at what animals can (or cannot) do that humans are good at. Here, we propose the opposite, to look more at what animals do that has not been explored yet in humans. For this aim, we will focus on a major cognitive function shared by animals and humans which is oral and gestural communication. After a general introduction highlighting the promising impact of opening the field to such parallels between animal and human communication, we will present a series of recent experiments built on this parallel. We will hear about auditory feedback processing and socially-mediated production in birds and humans, and about shared principles between apes and humans regarding vocal and gestural communication.

Speakers:

Constance Scharff

Anja T. Zai

Clara D. Martin

Yasemin B. Gultekin

Adrien Meguerditchian

SS5.EST.1 Let's hear it from the animals

Constance Scharff

Freie Universität Berlin, Germany

Comparative research on the similarities and differences between human and non-human ('animal') vocal communication has flourished during the past 15 years. Research on animals has also provided important insights into the potential evolutionary roots of some of the traits underlying human language. For instance, a fertile line of investigation addresses which of Hockett's design features are present in animal communication. In addition, unexpected parallels exist at the level of neural circuits and molecular networks relevant both for human language and learned animal vocalizations. In contrast, there is a scarcity of approaches that asks which aspects of vocal communication commonly found in animals might provide insights into human language. I will summarize some of the behavioral, neural and genetic findings about animal vocal communication, particular in songbirds, which can inform language research. Looking at language from an animal's point of view might provide a new perspective and provide impulses for experiments.

SS5.EST.2 The role of auditory feedback in vocal learning in songbirds

Anja T. Zai¹, Sophie Cavé-Lopez¹, Nicolas Giret², & Richard H.R. Hahnloser¹

1. *University of Zurich and ETH Zurich, Germany*

2. *Paris-Saclay, CNRS, France*

Auditory feedback is crucial for vocal learning and maintenance of already learned vocalizations in both songbirds and humans. We apply an alter-modal approach in songbirds to test whether auditory feedback is also necessary for trial-and-error processes of vocal learning. For this, we modified a widely used reinforcement learning paradigm using visual instead of auditory reinforcement and show that deaf birds successfully adapt their pitch in a targeted direction in response to the visual reinforcement. Furthermore, we show that hearing birds are also able to learn from visual reinforcement and that the basal ganglia is necessary for visual reinforcement learning of pitch. Our work demonstrates that trial-and-error learning in the basal ganglia requires no information about vocal performance. Thus, auditory feedback can be replaced to some extent by another sensory modality and successful speech rehabilitation strategies could arise from correlations between exploratory motor signals and alter-modal feedback.

SS5.EST.3 Humans speak as birds sing: Socially-mediated brain activity in language production

Clara D. Martín^{1,2}, Ileana Quinones¹, & Manuel Carreiras^{1,2}

1. *Basque Center on Cognition, Brain and Language, San Sebastian, Spain*

2. *Ikerbasque, Basque foundation for Science, Bilbao, Spain*

Brain activity during singing in zebra finches differs depending on the social context: The activation of the anterior pathway varies depending on whether the male zebra finch sings facing a female (directed song) or not (undirected song; for learning and rehearsal). Given the similarity of the anterior pathway (i.e., the "cortical – striatal – thalamocortical" loop) in birds and primates, we explored whether brain activity along this pathway is socially-mediated in humans producing language as it is the case in birds producing songs. Participants recited a poem in the MRI scanner while watching pictures of their partner, unknown persons and houses. We observed differential activation in a

cortico-subcortical (basal ganglia – temporal gyrus – angular gyrus) bilaterally distributed network. This study reveals that, as it is the case in birds, brain activity during language production varies depending on the social context (i.e., who the speaker is facing during poem recitation).

SS5.EST.4 Dynamics of vocal development in marmoset monkeys

Yasemin B. Gultekin¹, David Hildebrand², & Steffen R. Hage¹

1. *University of Tübingen, Germany*

2. *Rockefeller University, New York, USA*

Vocalizations of human infants change dramatically across the first postnatal year by becoming increasingly mature. Human vocal development is driven by learning from caretakers. In contrast, vocalizations of non-human primates are largely innate, and changes in the acoustic call structure during development have been purely devoted to maturation. However, recent studies revealed that vocal developmental processes in marmoset monkeys are influenced by parental feedback. Marmosets exhibit infant-specific vocal behaviour including distinct infant call types that becomes increasingly mature during the first postnatal months until the adult vocal behaviour is fully maintained. In my talk, I will give insights into recent studies and our new results on the dynamics of marmoset vocal development emphasizing the significant role of social feedback on primate vocal development, which can be affected by postnatal experience. These findings suggest the marmoset monkey as a compelling model system for human vocal development.

SS5.EST.5 The gestural origins of brain specialization for language: How studies in baboons inspired research on epileptic patient

Adrien Meguerditchian^{1,2} & Agnès Trébuchon^{1,3,4}

1. *Université Aix-Marseille/CNRS, Marseille, France*

2. *Station de Primatologie, UPS846, CNRS, Rousset, France*

3. *Hôpital de la Timone, CHU de Marseille, France*

4. *Université Aix-Marseille/INSERM, France*

For evaluating the possibility of brain surgery for treating patients suffering from epilepsy, there is a need for neurologist to preliminary investigate where most language functions are located in the brain and which hemisphere is dominant. Handedness has been historically considered as a behavioral marker of such language lateralization, but it turned out to be rather a poor marker. Whether a reliable behavioral asymmetrical manifestation of hemispheric specialization for language - which could be used by neurologist - exists remains unclear. Surprisingly it is the research on manual lateralization in baboons and other primates which led us to suggest that gestural communication's asymmetry might be a better behavioral landmark than handedness. Indeed, before testing such a hypothesis in epileptic patients at the Timone Hospital in Marseille, hand preferences for gestures have shown a significant increase of right-hand bias and contralateral neuroanatomical correlate within language areas' homologs according to MRI studies.

SS5.ATE

Where Next? The Future of Embodiment Research

Atenas Room

Chairs:

Falk Huettig

Markus Ostarek

Max Planck Institute for Psycholinguistics, Nijmegen

The approach to studying the mind, typically referred to as embodiment, which ascribes a central role to the modal systems in high-level cognitive functions, has been successful in accounting for a large number of mental phenomena (e.g. our understanding of concrete words, the flexibility of conceptual processing, etc.). Progress in our understanding of some core topics important for an all-encompassing account of embodied cognition (e.g., abstract processing, the extent to which modality-specific processes contribute functionally to cognition, the mechanisms of context-sensitive retrieval and processing of modal information) however has been painstakingly slow. The aim of the present symposium is to advance the development of such explanatory concepts. The talks in this symposium will showcase current state-of-the-art approaches to embodied cognition that attempt to provide some answers to these crucial issues.

Speakers:

Anna M. Borghi

Rolf Zwaan

Pia Knoeferle

Gabriela Vigliocco

Markus Ostarek

SS5.ATE.1 Embodied cognition and abstract concepts

Anna M. Borghi

Sapienza University of Rome and ISTC CNR, Rome

During the presentation I will address one of the most important challenges that embodied and grounded theories need to face, i.e. the challenge to explain how abstract concepts are acquired and represented. I will present evidence favoring the view according to which abstract concepts are grounded not only in sensorimotor experience, like concrete ones, but also and to a greater extent in linguistic, social and inner experience (interoception, metacognition). I will also present evidence showing that the weight of these different experiences (linguistic, social, inner) vary depending on the considered sub-kind of abstract concepts (e.g. mental states and spiritual concepts, numbers, emotions, social concepts). I will argue that the challenge to explain abstract concepts representation should be addressed with an integrated approach. Such an approach should bridge developmental and neuroscientific studies and should extend embodied and grounded views incorporating insights from pragmatics and from distributional statistics views of meaning.

SS5.ATE.2 From Vague Amalgamations to Specific Questions

Rolf Zwaan

Erasmus University, Rotterdam

Overlooking the history of the notion “embodied cognition” in the domain of language processing, one can identify three strands. The first strand is the Conceptual Metaphor strand, inspired by the work of Lakoff and Johnson. The second strand is the “motor processing” strand inspired by Rizzolatti’s work on mirror neurons. The third strand is the line of work inspired by Barsalou’s perceptual symbol theory. But how compatible are these strands really? And how relevant are they to theories of language processing? I will argue that the best way forward is not to search for evidence for or against some vague amalgamation of these strands of embodiment theory but rather to systematically, in large-scale projects, address a series of more specific questions, for example about whether visual representations come online during (1) word, (2) sentence, and (3) discourse processing. Such projects should involve preregistration, replication, and open materials, code, and data.

SS5.ATE.3 Situated and embodied language processing: predicting (variability in) context effects

Pia Knoeferle

Humboldt University, Berlin

Much research has assessed how language processing depends on the perceived context, the body, and long-term linguistic knowledge of the language user. But some context effects have proven difficult to replicate (e.g., action-sentence compatibility effect; how language related to old / young age primes people to exit the lab more slowly / rapidly respectively). These replication failures have led to a replication crisis in psychology. I propose that failures to replicate can be viewed as an opportunity for constraining theory-based hypotheses. If all context effects were robust, deriving systematic predictions regarding comprehension would be virtually impossible. The current crisis, however, suggests that some context effects may be subtler than others. I argue for constrained contextual flexibility. Variability in context effects is predicted by characteristics of the language user. But extant

findings also suggest generalizability beyond individual flexibility, thus imposing constraint on theory-driven expectations via the systematicity of processing preferences.

SS5.ATE.4 Iconicity as a window into embodiment

Gabriela Vigliocco¹ & Pamela Perniss²

1. *University College London*

2. *University of Brighton*

In recent years a number of studies have shown that iconicity (i.e., the use of linguistic form that imagistically evoke aspects of real word referents) in both spoken and signed languages impacts language development and language processing. Following Perniss & Vigliocco (2014) here we argue that investigating iconicity in multimodal communication (beyond iconicity in the phonology of a language to include gestures, other vocalizations and prosody) may provide critical insight into central issues in embodiment research. We will explore two cases: (i) Iconic forms can vary greatly with respect to their degree of abstractness and thus can provide some insight into the nature of the simulations used by speakers. (ii) iconicity can be more or less present in communication depending, for example, whether the topic of conversation concerns something present or absent from the physical environment and thus can clarify conditions when mental simulations need (or not) to be run.

SS5.ATE.5 Towards a unified theory of semantic cognition

Markus Ostarek & Falk Huettig

Max Planck Institute for Psycholinguistics, Nijmegen

The idea that semantic processing involves simulations of sensory states has become a generally accepted position in large portions of the field. However, the debate about the nature of the processes involved in language comprehension is far from settled. The following issues are crucial going forward: 1) The need for decisive paradigms: Many paradigms succumb to the consistency fallacy by virtue of not being able to arbitrate between rival theories. 2) The need for tests of causality. 3) The task dependency of conceptual processing. 4) The need for theoretical specificity regarding the direction and timing of effects. 5) The need for a theory that accounts for human abstraction capacities whilst taking the grounding problem seriously. We will discuss how innovative behavioral and neuroimaging methods (including pattern analysis and laminar fMRI) can help pave the way towards a unified theory of semantic cognition.

SS5.StT
Public Acceptance and Rejection of Science in a ‘Post-Truth’ World

Saint Tropez Room

Chair:

Stephan Lewandowsky
University of Bristol

Imagine a future world that considers knowledge to be “elitist.” Imagine a world in which it is not medical knowledge but a free-for-all opinion market on Twitter that determines whether a newly emergent strain of avian flu really is contagious to humans. This dystopian future is still just that—a possible future. However, there are signs that public discourse is evolving in this direction: terms such as “post-truth” and “fake news,” largely unknown until 2016, have exploded into media and public discourse and there is much concern about a presumed deterioration of the integrity of public discourse. This symposium examines the role of science in an emerging “post-truth” world and provides a number of perspectives on the factors that determine the acceptance and rejection of scientific findings, and how science denial might be best confronted.

Speakers:

Philipp Schmid
Kirsti M. Jylhä
Asheley R. Landrum
Sander van der Linden
Stephan Lewandowsky

SS5.StT.1 Advocating for science: How to rebut science denialism in public discussions

Philipp Schmid & Cornelia Betsch

University of Erfurt, Germany

Science deniers have infiltrated the media landscape, questioning milestones of science and spreading misinformation that contradicts decades of scientific endeavour. Advocates for science have few evidence-based strategies available to effectively rebut science denialism in public debates. Five experiments assess how to mitigate a denier's influence on the audience. Four experiments are preregistered conceptual replications of the initial experiment. An internal meta-analysis across all five experiments reveals that not responding to science deniers has a negative effect on attitudes towards behaviours favoured by science (e.g., vaccination) and the intentions to perform these behaviours. Providing the facts regarding the topic or uncovering the rhetorical techniques typical for denialism had positive effects. The most effective strategy was a combination of both, formulating the Response By Using Technique and Topic Against Lies (ReBUTTAL). Training advocates to apply ReBUTTAL can support the fight against misinformation and strengthen the evidence-based voice for science.

SS5.StT.2 Populist right-wing attitudes and climate change denial: The roles of anti-egalitarianism, conservative ideology, and anti-establishment attitudesKirsti M. Jylhä¹ & Kahl Hellmer²1. *Institute for Futures Studies, Stockholm, Sweden*2. *Uppsala University, Uppsala, Sweden*

Populist right-wing parties and their voters tend to be inclined to dismiss climate change. We investigated correlations between populist right-wing attitudes and climate change denial in two studies (1: $N=1587$; 2: $N=895$). Anti-egalitarianism (an index of xenophobia and negative views on feminism, same-sex marriage, and society's attention on minorities) was found to be the strongest predictor of climate change denial in both studies. Anti-establishment attitudes predicted climate change denial only through anti-egalitarianism (Study 1&2) and – to lesser degree – science skepticism (Study 1). Conservative values had a direct (Study 1), and authoritarian attitudes had an indirect (Study 2), effect on climate change denial. Personality trait Openness (but not Agreeableness) predicted climate change denial through anti-egalitarianism and conservatism/ authoritarianism. In sum, climate change denial has linkages with critical views on (liberal parts of) the establishment. However, rather than reflecting anti-establishment views per se, climate change denial seems to reflect endorsement of the existing social power relations.

SS5.StT.3 'It's not a planet, it's a plane': Exploring Flat Earth Ideology

Asheley R. Landrum & Alex Olshansky

Texas Tech University

Flat Earth ideology is the epitome of science denial. Despite irrefutable evidence that the Earth is not flat, an increasing number of people are converting to hold this view—much to the chagrin of academics and the popular press. To better understand this phenomenon, we interviewed 28 of the approximately 500 attendees of the first annual Flat Earth Conference in Raleigh, North Carolina, USA, in November, 2017. In addition to capturing participants' mental models of the Earth, we asked when they first started to question the spherical Earth. We also asked about participants' impressions

of the evidence for and against the flat earth model and about some of their other views, values, and beliefs. Drawing on concepts from motivated cognition, we argue that our data show that conspiracy mentality conditional on religiosity is key in predicting susceptibility to flat earth ideology. Moreover, exposure to such beliefs primarily occurs on YouTube. Importantly, so-called Flat Earthers attempt to use science-based arguments to support their worldview. All in all, Flat Earthers do not see themselves as rejecting science, but rejecting corrupt scientific authorities.

SS5.StT.4 Inoculating against scientific misinformation: On the motivated cognition of facts and expertise in a post-truth society

Sander van der Linden

University of Cambridge, UK

In this talk, I will discuss recent psychological theorizing around attitude polarization, motivated cognition, and science denial. I'll start by presenting a series of nationally representative experimental studies (N = 6,301) examining the crucial role of expert consensus in how people form judgments about contested scientific issues (e.g. global warming, vaccines) across the ideological spectrum. Past research has relied on two important findings; a) public acceptance of science is known to correlate strongly with political ideology, and b) the greatest degree of polarization seems to occur among the most educated partisans. Because most of the evidence in this domain emerges indirectly through correlational surveys, the connection between A and B is not causal, so I refer to this specific strain of motivated science denial as the "correlation-causation" fallacy. In contrast, experimental studies presented in this talk reveal that although such correlations are replicable, experimentally manipulated cues about expert consensus can neutralize motivated numeracy effects about attitude dissonant science. Specifically, the Gateway Belief Model (GBM) account suggests that highlighting second-order normative cognitions (such as expert consensus) can bridge the ideological divide. Importantly, I will also show that perceptual judgments of expert consensus are not formed in a vacuum and are highly susceptible to misinformation, which can spread much like a viral contagion. By combining data from the lab and the field, I'll end by demonstrating that it is possible to cognitively inoculate ("vaccinate") public attitudes against a growing climate of science denial.

SS5.StT.5 Rejection of scientific findings: Worldview, ideology, and the norms of science

Stephan Lewandowsky¹ & Klaus Oberauer²

1. *University of Bristol*

2. *University of Zurich*

Scientifically well-established propositions, such as the fact that greenhouse gas emissions are affecting the Earth's climate, are sometimes rejected by segments of the public. Public-opinion surveys have repeatedly shown that the rejection of scientific evidence across a broad range of domains is associated with right-wing or libertarian political views. To date there is little evidence of any association between left-wing political views and rejection of scientific evidence. What might explain this apparent asymmetry? What might explain the fact that science denial is seemingly focused on the political right? I focus on Merton's (1942) analysis of the norms of science, such as communism and universalism, which continue to be internalized by the scientific community but which are not readily reconciled with conservative values. We report a large-scale study that shows that people's political and cultural worldviews are associated with their attitudes towards those scientific norms, and that

those attitudes in turn predict people's acceptance of vaccinations and climate science. The norms of science may thus be in latent conflict with a substantial segment of the public. We additionally show that other forms of information that do not pertain to scientific issues, such as false statements by Donald Trump or Bernie Sanders on the campaign trail, are processed in a roughly symmetrical fashion by people on the political right or left, providing further support for the notion that scientific findings have a special status in politically-motivated information processing.

SS5.TAR
Spatial Learning and Navigation
from the Individual Differences Perspective

Tarraco Room

Chair:

Chiara Meneghetti
University of Padova (Italy)

Our ability to learn an environment and navigate it efficiently is influenced by numerous factors, including environmental features, but also individual characteristics. Concerning the latter, a set of spatial abilities, self-reported preferences and strategies, and aspects of personality can influence our environment learning and navigation performance. The role of gender, age and familiarity with an environment are relevant individual aspects too. The issue of the multi-faceted individual differences in spatial learning and navigation is complex, and deserves to be further examined. The present symposium aims to explore how individual spatial abilities (as mental rotation), self-reported preferences and strategies (as perceived navigating skills), personality traits, familiarity with a place, gender and age relate to the construction of accurate spatial mental representations of an environment. Five researchers will present studies conducted using different methods to offer new insight on the role of individual differences in the spatial learning and navigation domain.

Speakers:

Francesca Pazzaglia
Martina Rahe
Michiel H.G. Claessen
Marios Avraamides
Valerie Gyselinck

SS5.TAR.1 Emotional, motivational and personality factors in wayfinding behavior

Francesca Pazzaglia & Chiara Meneghetti

University of Padova

Wayfinding (WF) is the ability to move around efficiently. It is a multifaceted skill, susceptible to wide individual differences, and requires a broad range of cognitive functions. So far, research on WF has devoted little attention to the role of emotion, motivation, and personality factors, although these variables have proved important in the performance of other spatial tasks. The current set of studies explored whether non-cognitive factors, such as spatial self-efficacy and anxiety, pleasure in exploring, and personality are in relation with WF. Participants completed questionnaires designed to test emotion, motivation and personality. Afterwards, they memorized paths through urban virtual environments and performed WF tasks. The results showed that the considered individual variables were related with wayfinding performance. The relationship was stronger with demanding than easier WF tasks.

SS5.TAR.2 Are men's and women's navigation skills related to their performance in a mental-rotation test?

Martina Rahe & Claudia Quaizer-Pohl

University of Koblenz-Landau

The study examined the influence of navigation skills on adults' mental-rotation performance as well as gender differences and participants' self-evaluation of these abilities. 39 women and 51 men undergraduates solved a pointing task, either the Male-objects-MRT or Female-objects-MRT, and evaluated their task performance. Positive correlations between mental-rotation performance and pointing towards a landmark appeared only for males. Negative correlations between mental-rotation performance and the usage of orientation tools like compass or maps appeared for females. Only men evaluated their MRT performance adequately and reported higher abilities of mental-rotation and spatial orientation than women. For the MRT, a significant interaction of gender and stimulus material appeared. Women who perform poorly in mental-rotation tests might use maps more often, because they need to. Males seem to have better abilities to self-evaluate their spatial skills. The role of mental rotation in relation to navigation abilities in males and females will be discussed.

SS5.TAR.3 Objective and subjective navigation ability across the lifespan

Ineke J.M. van der Ham, Michiel H.G. Claessen, & Milan N.A. van der Kuil

Leiden University, the Netherlands

Navigation ability shows substantial variation within healthy population, yet the causes for this variation remain unclear. In a large-scale online navigation experiment, we have assessed navigation ability in 11.887 individuals (age range 8-100). After viewing a video of a route through an environment, landmark, location and path knowledge were assessed with 5 tasks: landmark recognition, pointing to the endpoint, placing landmarks on a map, directional information about the route, and distance comparison between landmarks. Results indicate clearly differential aging patterns for each of the five tasks. Impact of gender was limited; males outperformed females in placing landmarks on a map and directional information, but performance was equal for the other tasks. Subjective measures of perceived navigation ability indicate a substantial overestimation with higher age and in

males, and underestimation in females. The impact of measures of spatial anxiety, spatial experience, and living environment will also be discussed.

SS5.TAR.4 Spatial memory about familiar and unfamiliar environments

Marios Avraamides¹, Adamantini Hatzipanayioti², & Marianna Pagkratidou¹

1. *University of Cyprus*

2. *Max-Planck-Institute for Biological Cybernetics*

Research in spatial cognition examining how unfamiliar spatial layouts are represented in memory, has shown that people create orientation-dependent representations that are influenced by both environmental (e.g., geometry of the enclosing space, the internal structure of the layout) and contextual (e.g., the study viewpoint, the viewpoints of conversational partners, instructions) factors. However, what remains unclear is whether these representations change after repeated experience with the layout. For example, does an orientation-dependent memory become orientation-free after prolonged exposure to a layout from all possible viewpoints? We examined this question by comparing the spatial memories of participants about their own rooms in the university halls vs. those of other participants who viewed the same rooms for the first time through Virtual Reality. Similarities and differences across the two conditions were found in the pointing data from a perspective taking task. The implications of the findings for spatial memory are discussed.

SS5.TAR.5 Landmarks and familiarity in large-scale spatial representations

Valérie Gyselinck^{1,2}, Vanessa Ligonnière^{1,2}, Aurélie Dommès¹, & Elise Grison^{1,3}

1. *The French institute of science and technology for transport, development and networks (IFSTTAR)*

2. *Parin Descartes University*

3. *Société Nationale des Chemins de fer Français (SNCF) Innovation & Research*

As shown by decades of research, human navigation and orientation in large-scale environments is a fundamental function that exhibits high inter-individual variability related to cognitive factors, styles and also to the familiarity with the environment. Research in spatial cognition has also evidenced the importance of landmarks to construct a spatial representation and help navigation, but only scarce attention was paid to integrate these dimensions into the design of navigation aids. Two experiments were conducted to explore the benefit of a landmark-oriented navigation aid compared to the classical turn-by-turn aid in constructing spatial representations. The familiarity with landmarks was explored in young and older adults in one experiment. The familiarity with the environment in young adults was considered in the second experiment. Individual differences in spatial ability were also measured. The discussion will focus on the development of the concept of human-like guidance in relation to familiarity.

SS5.BAR

Auditory Comprehension under Adverse Listening Conditions

Barcelona Room

Chairs:

Sendy Caffarra

Sara Guediche

BCBL. Basque Center on Cognition, Brain and Language, Spain

Research investigating behavioral and neural underpinnings of speech comprehension under different listening conditions is growing. Applications of this work range from research on speech recognition technologies, cochlear implants, and hearing impairment with the aim of enhancing the extraction of linguistic information from the auditory signal. Our goal for the workshop is to identify behavioral and neural markers that can support the mapping of sound onto meaning. We turn to distinct lines of research to draw cross-disciplinary connections that will help us better understand potential obstacles in this mapping and its potential interactions with contextual and cognitive factors. The talks will address this topic at different levels of linguistic analysis (phonological, lexical, semantic, and syntactic) and from distinct methodological perspectives (behavioral, fNIRS, EEG, fMRI). Signals causing ambiguity (distorted, accented, noisy) in the sound-to-meaning mapping will be considered for typical and atypical hearing, using different speech (words, sentences) and non-speech (music) stimuli.

Speakers:

Sven Mattys

Heather Bortfeld

Tessa Bent

Antje Strauss

Robert Zatorre

SS5.BAR.1 Effects of cognitive load on speech processing

Sven Mattys

University of York

Improving the validity of speech-recognition models requires an understanding of how speech is processed in everyday life. Unlike listening conditions leading to a degradation of the signal (e.g., noise), adverse conditions that do not alter the integrity of the signal (e.g., cognitive load, CL) have been under-studied. Drawing upon behavioral and imaging methods, our research shows that CL reduces sensitivity to phonetic detail and increases reliance on lexical knowledge. Critically, however, we found that increased reliance on lexical knowledge under CL is a cascaded effect of impoverished phonetic processing, not a direct consequence of CL. Findings of increased pure-tone auditory thresholds under CL add further support to the case for an early locus of interference. The results not only constrain our understating of the functional architecture of speech-recognition models, they also invite an integrated analysis of hearing, psycholinguistics, and cognition.

SS5.BAR.2 Assessing quality of speech perception in pediatric and adult cochlear implantees using functional near-infrared spectroscopy

Heather Bortfeld

University of California, Merced

Cochlear implants establish a way for profoundly deaf individuals to understand speech by allowing sound to be transmitted to the auditory system without a working conduction system in the inner ear. Indeed, implants have become a standard treatment for deafness, despite wide variability in speech perception outcomes in both implanted children and adults. To better understand the source of this variability, my collaborators and I have been using functional near-infrared spectroscopy (fNIRS) to image activity within regions of the auditory cortex post-implantation. This work has established fNIRS as a tool for use with cochlear implantees because it is non-invasive, compatible with implanted devices, and not subject to the electrical artifacts typical of other methods. In this talk, I will present our findings delineating patterns of cortical responses that reflect good speech perception abilities in postlingually deafened adults and discuss how we now are extending this work to prelingually deafened children.

SS5.BAR.3 How unfamiliar accents impact children's and adults' word recognition

Tessa Bent

Indiana University

Unfamiliar nonnative accents and regional dialects can differ from a listener's home dialect along both segmental (individual speech sounds) and suprasegmental (e.g., intonation, rhythm) dimensions. These acoustic-phonetic differences can result in word recognition accuracy decrements, the extent to which depends on the interaction of talker, listener, and environmental factors. For example, adults can typically understand talkers with unfamiliar accents in quiet conditions, but show steep declines when noise is added. In contrast, children show lowered word recognition accuracy with unfamiliar accents even in quiet and display particularly poor performance when noise is added. Further, word recognition with unfamiliar accents displays a protracted developmental trajectory, extending into adolescence. Ongoing work is examining why listeners find specific talkers or accents

are more or less intelligible by quantifying global pronunciation distances from the ambient dialect as well as deviations from native norms within different levels of sound structure (e.g., segmental vs. suprasegmental).

SS5.BAR.4 The importance of tracking word and sentence onsets for speech comprehension in noise. Evidence from EEG

Antje Strauss

University of Konstanz

Recent neurolinguistic studies have focused on neural entrainment as a key mechanism to achieve speech comprehension, also when speech is degraded. However, it is known that auditory cortex, in particular the posterior portion of superior temporal gyrus, is especially sensitive to speech onsets as opposed to sustained information processing in more anterior regions. Here, I would like to argue that for successful speech comprehension in noise, entrainment is not a sufficient prerequisite. Instead, I am showing evidence that it is decisive to find onsets of words and sentences in speech streams in order to elicit further processing. To this end, listeners can allocate attentional resources as indicated by prestimulus alpha oscillations. Furthermore, listeners can make use of the overall speech rhythm of a speaker (e.g. measured by neural entrainment) to better align with sentence onsets. These findings are additionally supported by causal evidence coming from transcranial alternating current stimulation (tDCS).

SS5.BAR.5 Musicians at the cocktail party and at the concert: neural mechanisms for auditory scene analysis of speech and music

Robert Zatorre & Emily Coffey

McGill University; Concordia University

Listening under adverse conditions is typically measured with speech, but music represents an opportunity to better understand auditory scene analysis (ASA). Using fMRI, EEG and MEG we have studied the neural basis for ASA enhancement related to musical training. We find that the musician advantage for speech perception is mediated both by stronger representations in subcortical and cortical regions, as well as by recruitment of top-down mechanisms in frontal and motor cortices. Moreover, musicians demonstrate better encoding of both attended and ignored speech streams in auditory areas. Because ASA in real environments is a composite skill involving integrated spatial, visual and predictive cues, we implemented behavioural and fMRI tasks that dissect complex auditory perception and measure musicians' specific advantages. Studying the neurophysiological bases of experience using musical stimuli will allow us to pinpoint the role and potential of experience in influencing how information is extracted from auditory signals.

SS5.PAL

Exploring Decision-Making through Computational Modeling

Palma de Mallorca Room

Chairs:

Cristian Buc Calderon
Ghent University (Ghent, Belgium)

Irene Cogliati-Dezza
Université Libre de Bruxelles

Decision-making processes subtend sensorimotor mappings. Understanding their temporal dynamics and how they interact is therefore crucial to gain insights on how adaptive and flexible behaviors develop. Unfortunately, deriving predictions about decision processes can be arduous and non-intuitive. Here computational models can provide a powerful tool by specifying the underlying decision computations giving rise to behavioral outputs, and thereby to specific empirical predictions. Notably, programming packages now allow computational modeling to be in the realm of any cognitive psychologist. Based on different modeling techniques (i.e. neural networks, reinforcement learning, probabilistic inference and hierarchical drift-diffusion modeling), the talks in this symposium will present exciting new developments expanding our understanding of distinct decision-making facets: How humans balance exploration and exploitation (Irene Cogliati), how prospective goal representations affect decisions (Giovanni Pezzulo), how confidence affects decisions (Kobe Desender), how metacognitive signals guide decisions (Marion Rouault), how future outcomes are progressively unraveled during decisions (Cristian Calderon).

Speakers:

Irene Cogliati-Dezza
Giovanni Pezzulo
Kobe Desender
Marion Rouault
Cristian Buc Calderon

SS5.PAL.1 The Exploration-Exploitation Dilemma as a Tool for Studying Addiction

Irene Cogliati-Dezza

Université Libre de Bruxelles, Brussels, Belgium

Addiction is a complex psychiatry condition manifested as a loss of control over drug usage, or non-drug behavior, despite harmful consequences. In this study, we attempt to gain insight into this disorder by investigating the way addicted individuals negotiate the exploration-exploitation dilemma in a sequential decision-making task, in comparison to healthy controls. We focus on a population of problem gamblers, who are addicted to a certain type of harmful behavior i.e., gambling, but whose behavioral pathology does not suffer from the confounding effects of consuming drugs. We use a computational model, previously validated in a healthy sample, to study the nature of pathology in gamblers. The results show that problem gamblers employ a decision policy that under-explores uncertain elements of the environment in a specific manner. This study opens up a new way of investigating addictive disorders, and of interpreting its main symptoms as impairments in learning and decision-making mechanisms.

SS5.PAL.2 Prospective goal representations in decision-making

Giovanni Pezzulo

National Research Council of Italy, Rome, Italy

Many decisions in humans and other animals are guided by internally defined goals, such as for example reaching a specific location (when selecting a route) or preparing a specific dinner (when buying ingredients). I will illustrate two computational studies that aim at elucidating the neural and computational mechanisms supporting such goal-directed choices. The first study will introduce the essential computations of a goal-directed system; i.e., the prediction of future outcomes and their evaluation in relation to internal goals. Furthermore, it will show that a neural circuit formed by the hippocampus, the ventral striatum and the prefrontal cortex may implement goal-directed computations during spatial navigation. The second study will show that internal representations of prospective goals (analogous to "goal codes" found in monkey prefrontal cortex) emerge in a computational architecture that combines principles of unsupervised and reward-based learning; and that these prospective goal codes afford efficient decision-making.

SS5.PAL.3 Post-decisional sense of confidence shapes speed-accuracy tradeoff for subsequent choices

Kobe Desender

University Medical Center Hamburg-Eppendorf, Hamburg, Germany

In the absence of external feedback about decision outcomes, agents need to adapt their decision policies based on their internal evaluation of their own performance (i.e., decision confidence). We hypothesized that agents use decision confidence to continuously update the tradeoff between the speed and the accuracy of their decisions. We tested this prediction by fitting a bounded accumulation model to behavioral data from three different perceptual tasks, which entailed a binary choice with subsequent confidence rating. Indeed, decision bounds depended on the reported confidence about the correctness of the previous choice. Decision bounds were particularly strongly increased after participants were relatively certain to have made an error. The increase in decision bound was

predicted by a post-decisional EEG signal sensitive to confidence and error perception (the so-called error positivity) peaking over centro-parietal cortex. We conclude post-decisional confidence signals are used to adapt ongoing adjustment of decision policies.

SS5.PAL.4 Forming global estimates of self-performance from local confidence

Marion Rouault

University College London, London, UK

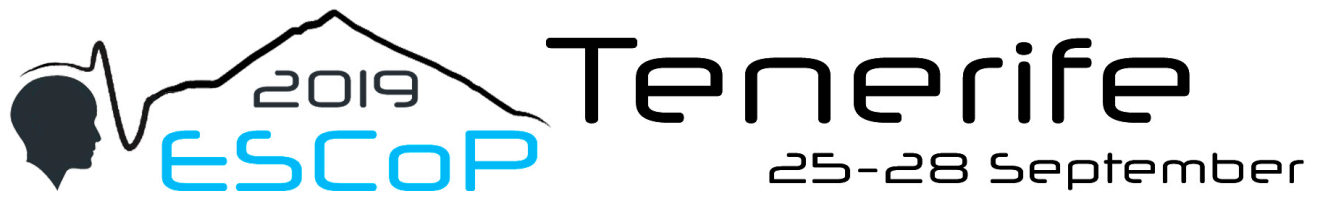
Metacognition, the ability to internally evaluate our own decisions, is particularly useful since many real-life decisions lack immediate feedback. Most previous studies have focused on the construction of confidence at the level of single decisions, but little is known about the formation of “global” self-performance estimates (SPEs) aggregated from multiple decisions. Here, we compare the formation of SPEs in the presence and absence of feedback, testing the hypothesis that local decision confidence supports the formation of SPEs when feedback is unavailable. We reveal that humans pervasively underestimate their performance in the absence of feedback, compared to a condition with full feedback, despite objective performance being unaffected. We found that fluctuations in confidence contribute to global SPEs over and above objective accuracy and reaction times. Our findings create a bridge between local confidence and global SPEs, and support a functional role for confidence in higher-order behavioral control.

SS5.PAL.5 Additive evidence integration in multi-step decision making

Cristian Buc Calderon

Ghent University, Ghent, Belgium

Multi-step decision making situation pervades daily life, but its underlying mechanisms remain obscure. In this talk, we will distinguish four prominent models of multi-step decision making, namely serial stage, hierarchical evidence integration (HEI), hierarchical leaky competing accumulation (HLCA), and probabilistic evidence integration (PEI). We will further discuss how we were able to disentangle these models using a novel two-step reward-based decision paradigm. Our paradigm allowed testing a unique prediction of the HLCA and PEI models. Strikingly, but as predicted by these models, we show that the first-step decision dynamics were initially attracted towards the choice representing the highest sum/mean before being redirected towards the choice representing the maximal reward. Our results demonstrate that, in multi-step decisions, future outcomes of potential actions are progressively unraveled during the decision process.



ORAL PRESENTATIONS. ABSTRACTS

ORAL SESSION 1

Thursday 26th

14:40-17:20

Auditorio

Neuroscience of Language

OS1.AUD.1 WHEN THE CONTEXT MODULATES LANGUAGE PROCESSING: A BEHAVIORAL AND ELECTROPHYSIO-LOGICAL STUDY

Beauprez, S.-A., Laroche, B., Perret, C., & Bidet-Ildei, C.
Centre de Recherches sur la Cognition et l'Apprentissage (CeRCA), France
 Presenting author: Sophie-Anne Beauprez

In our everyday life, we perceive others performing actions in a context. It is critical since it provides information participating to the understanding of this action. The aim of the study was to investigate how this context could modulate language processing. We recorded behavioral and electrophysiological measures of participants performing a semantic decision task involving a verb after observing a picture depicting an action performed in a usual or an unusual context. The results revealed different behavioral and topographical pattern responses according to the context in which an action is presented. Action verb processing was facilitated by the prior observation of an action, only in the usual context. Moreover, the topographic analysis revealed that this facilitation was related to reduced processing times for the semantic access to the verb and for the motor preparation for the answer. Altogether, these findings demonstrate that the context is crucial in the action-language relationship.

OS1.AUD.2 LANGUAGE CONTROL PROCESSES: DOMAIN GENERAL OR DOMAIN-SPECIFIC?

Attout, L. & Majerus, S.
University of Liège, Belgium
 Presenting author: Lucie Attout

There remain major doubts about the nature and domain specificity of inhibitory control processes, both within and between cognitive domains. The present fMRI study assessed the neural substrates associated with inhibitory control processes within in the language domain, by comparing phonological versus semantic control processes. Thirty-four elderly participants (59.6 ± 6.1 years old) performed phonological similarity and semantic similarity judgment tasks involving the inhibition of highly or weakly

interfering stimuli. A direct contrast between the two task conditions revealed two distinct networks: a temporo-parietal network for phonological control and a temporo-frontal network for semantic control. Common activity was observed in a large dorsal attention network including bilaterally the insula. Moreover, multivariate voxel pattern analysis showed reliable decoding of neural patterns associated with high versus weak inhibitory control in both tasks. These results provide novel evidence for a dissociation between phonological and semantic language control processes.

OS1.AUD.3 THE N170 COMPONENT: AN ELECTRO-PHYSIOLOGICAL INDEX OF LEXICAL ACCESS IN GOOD AND POOR READERS?

Mahé, G.¹, Bonnefond, A.², & Nadège, D.C.²
1 SCALab - University of Lille; 2 University of Strasbourg
 Presenting author: Gwendoline Mahé

The aim of the present study was to determine the lexical characteristics of the N170 component according to reading skills. Good and poor readers performed two lexical decision tasks on which lexical access availability (format familiarity with stimuli displayed horizontally or vertically in a marquee format) and task difficulty (with separated or mixed horizontal and vertical blocks) were manipulated. Results revealed an impact of both reading skills and task difficulty on N170 lexicality effect, with specific effects at right sites related to poor reading skills and an increase of the lexicality effect with task difficulty. Surprisingly, format familiarity did not affect N170 lexicality effect. Spatio-temporal segmentation analysis revealed the engagement of a similar visual word form analysis for both formats, with only a longer duration to complete those processes for the unfamiliar format. The present findings revealed new insights concerning early lexical access in good and poor readers.

OS1.AUD.4 INTEGRATING FORM AND MEANING IN THE LEFT PARIETAL CORTEX.

Quiñones, I.¹, Molinaro, N.^{1,2}, Caballero, C.¹, Mancini, S.¹, Hernández-Cabrera, J.A.⁴, Barber, H.A.⁴, & Carreiras, M.^{1,2,3}
 1 BCBL. Basque Center on Cognition, Brain and Language, Donostia, Spain; 2 IKERBASQUE. Basque Foundation for Science, Bilbao, Spain; 3 University of the Basque Country, UPV/EHU, Bilbao, Spain; 4. Universidad de La Laguna, Spain

Presenting author: Ileana Quiñones

Assessing the synchrony and interplay between distributed neural regions should be critical to understanding how the language system operates. We investigated the possible neuro-functional link between form and meaning during sentence comprehension by combining a classical whole-brain approach addressed to characterize brain activation patterns as a function of our conditions and a network-based approach aimed at pinpointing the topology and dynamics of those regions emerging as critical. Capitalizing the Spanish gender agreement system, we experimentally disengage formal and conceptual factors: nouns-adjectives gender congruency and the type of gender system a noun belongs to – i.e., conceptual or formal depending on the availability of semantic gender information. Left IFG, as well as left MTG/STG emerged as critical areas for the computation of grammatical relations. However, critically, we identified the interplay between the AG and the left perisylvian language-specific circuit as a crucial hub for the achievement of a coherent and meaningful message.

OS1.AUD.5 CATECHOLAMINERGIC MODULATION OF THE SEMANTIC PROCESSING IN SENTENCE COMPREHENSION

Tan, Y. & Hagoort, P.

Max Planck Institute of Psycholinguistics, The Netherlands

Presenting author: Yingying Tan

This study investigated the role of catecholamine (CA) neurotransmitters (e.g., dopamine) in language comprehension by examining the effects of methylphenidate, which is a CA agonist, on the electroencephalogram (EEG) response related to semantic processing. This study used a double-blind, placebo-controlled, within-subject design. Forty-eight healthy participants read semantic congruent or incongruent sentences after receiving 20 mg methylphenidate or a placebo, while brain activities were monitored with an EEG recording. Importantly, the results showed that MPH has a task-dependent neuropharmacological effect on semantic processing. When semantic processing was task-irrelevant, MPH enhanced the detection of semantic incongruence as indexed by a larger N400 effect; when semantic processing was task-relevant, MPH induced a smaller reduction in the N400 response in the congruent

condition, which was followed by a larger late positive complex effect. These results suggest that CA-related neurotransmitters enhance language processing possibly through providing a relevance signal amplifying the salience of semantic processing.

OS1.AUD.6 INFLUENCE OF PHONOLOGICAL AND SEMANTIC FACTORS ON THE ACQUISITION OF NOVEL WRITTEN WORD-FORMS: ERP EVIDENCE

Bermúdez-Margaretto, B.¹, Beltrán, D.², Shtyrov, Y.³, Domínguez, A.², & Cuetos, F.⁴

1 National Research University - Higher School of Economics, Moscow, Russia; 2 Universidad de La Laguna, Tenerife, Spain; 3 Aarhus University, Aarhus, Denmark; 4 Universidad de Oviedo, Oviedo, Spain

Presenting author: Beatriz Bermúdez-Margaretto

Acquisition of new vocabulary is usually mediated by previous experience with language. In visual domain, orthographically unfamiliar forms may already have corresponding phonological or even conceptual representations in linguistic system, which facilitates orthographic learning. The neural correlates of this advantage were investigated by recording EEG during reading novel and familiar words. Participants were divided into three groups (n=26 each) for a previous training (six exposures) with: (1) only phonology of novel words (auditory exposure), (2) both phonology and meaning (auditory+picture), or (3) no training. Already at the first visual presentation, early neural responses to novel words, reflected in P200, become indistinguishable from familiar words, regardless of the phonological or semantic nature of training. The no-training condition, however, showed a clear lexicality effect: stronger P200 responses for familiar than novel words. These results suggest the key role of phonology in orthographically transparent reading systems, enabling rapid build-up of novel word-form representations.

OS1.AUD.7 AN OSCILLATORY MODEL OF NOUN-VERB DISSOCIATIONS: MEG EVIDENCE FROM HEALTHY PARTICIPANTS AND BRAIN TUMOR PATIENTS

Amoruso, L.^{1,2}, Molinaro, N.^{1,2}, Geng, S.¹, Quiñones, I.¹, Timofeeva, P.¹, Gisbert-Muñoz, S.¹, Gil-Robles, S.^{3,4}, Pomposo, I.⁴, & Carreiras, M.^{1,2,5}

1 Basque Center on Cognition, Brain and Language (BCBL), Spain; 2 IKERBASQUE, Basque Foundation for Science, Spain; 3 Hospital Quiron, Spain; 4 BioCruces Research Institute, Spain; 5 University of the Basque Country, UPV/EHU, Spain

Presenting author: Lucia Amoruso

In the present study, we measured spatiotemporal dynamics of MEG oscillations in the intact and the damaged brain during noun and verb naming. This investigation was motivated by current lack of agreement as to the extent of the functional/anatomical dissociation underpinning the noun-verb dichotomy. Overall, we found that the production of concrete nouns and motion verbs in the context of a minimal sentence showed different spectro-temporal responses and distinct underlying cortical sources in healthy participants. When testing this model in brain tumor patients, we found a specific dissociation in the beta frequency-range: patients with temporal damage exhibited functional compensation only for object naming, while patients with fronto-parietal damage exhibited compensation only for action naming. Together, these findings suggest the involvement of partially different networks for both categories, at least when underscoring semantic distinctions between them, and provide evidence for a role of beta oscillations as a marker of language preservation.

OS1.AUD.8 ALTERATIONS OF NEURAL LANGUAGE PROCESSING IN HEALTHY AGING: EVIDENCE FROM PASSIVE NEUROMAGNETIC RESPONSES TO SPEECH

Hyder, R.¹, Højlund, A.¹, Jensen, M.¹, Østergaard, K.², & Shtyrov, Y..¹

1 Aarhus University, Denmark; 2 Aarhus University Hospital, Denmark

Presenting author: Rasha Hyder

Assessment of neurocognitive status of language comprehension often relies on overt behaviour, which is only a proxy measure of brain function. To scrutinise aging influence on the functioning of language neural circuits independently from focused attention and behavioural tasks, we designed a novel paradigm which allows quantifying a range of neurolinguistic processes in a task-free unattended manner. This is achieved by recording the brain's responses to different speech sounds using magneto- and electroencephalography (MEG/EEG). This paradigm was applied to healthy young and elderly participants who were presented with an unattended sequence of speech stimuli with tightly controlled lexical, semantic and syntactic contrasts. The results revealed a range of effects of aging on different levels of linguistic processing: reduced, delayed and topographically shifted lexico-semantic ERFs and fully absent correlates of automatic syntactic parsing. We will discuss implications of this approach to the study of neurolinguistics processing in healthy ageing and neurodegeneration.

Cibeles Room

Perception

OS1.CIB.1 ACCELERATED PERCEPTION: THE ATTENTIONAL BOW WAVE PHENOMENON

Akyürek, E.G.¹ & Wolff, M.J.^{1,2}

1 University of Groningen, The Netherlands; 2 University of Oxford, United Kingdom

Presenting author: Elkan Akyürek

The speed at which we process perceptual information is typically estimated by tracking activity evoked by a single, isolated stimulus in the brain. Although this provides important knowledge, it cannot characterize what happens during dynamic perception. This is most unfortunate, because perceptual input constantly changes in the real world, and our perceptual system rarely deals with individual, isolated stimuli. Limited progress has been made in this direction, due to the fact that successive stimuli often interfere with one another (e.g., by masking), and because signal overlap makes brain activity hard to attribute to any one stimulus in a rapid sequence. We overcame these difficulties by applying multivariate pattern analysis to EEG recorded in a temporal integration task that avoided destructive masking. We observed a novel phenomenon: Stimulus processing was not slowed down by a shortly preceding stimulus, but accelerated instead. This “bow wave” phenomenon seemed to be attentional in nature.

OS1.CIB.2 STUDYING PERCEPTION WITH SUBMILLESCOND COMPLEX IMAGES

Beauny, A., de Heering, A., Muñoz-Moldes, S., Martin, J.-R., de Beir, A., & Cleeremans, A.

Université libre de Bruxelles

Presenting author: Axel Cleeremans

Unconscious perception remains controversial. Here, we used psychophysical methods applied to unmasked visual stimuli presented for extremely short durations (in the μ sec range) by means of a custom-built modern tachistoscope. In a first phase, natural or urban scenes were either absent or present on the screen, and participants evaluated their subjective perception using a 3-points scale (no stimulus, stimulus detection or stimulus identification). Responses were tracked by means of two staircases. One

aimed to define the threshold of subjective detection; the second aimed to define the identification threshold. In a second phase, participants performed an objective categorization task in which they had to decide whether each image was natural vs. urban. A third staircase was used to build a psychometric curve reflecting objective categorization performance. We found that objective performance, here assumed to reflect the contribution of both conscious and unconscious trials, cannot be explained based exclusively on conscious trials.

OS1.CIB.3 PUTTING THE WORLD IN MIND: THE CASE OF QUANTITY PERCEPTION

Katzin, N., Salti, M., & Henik, A.

Ben Gurion University of the Negev

Presenting author: Naama Katzin

Enumeration up to four, subitizing, is accurate and fast with only 50-80ms increase per item. Enumeration above four, estimation, is less accurate and more time consuming with an additional cost of 200ms per item. Subitizing and estimation are considered two distinct processes. We suggest that the shape of the convex hull, the polygon created by the smallest set (of dots) that contains all stimuli, may account for both processes. We first show. Using geometric probability, the correlation between shape of convex hull and numerosity. Then, in two experiments we show that enumeration of dot arrays is modulated by the number of vertices on the convex hull. Namely, a low number of vertices on the convex hull yields an underestimation of numerosity; a high number of vertices on the convex hull yields an overestimation of numerosity. We suggest that the perceptual system utilizes convex hull as a heuristic to estimate numerosity.

OS1.CIB.4 SYNAESTHESIA AND EXPERTISE SHARE COMMON COGNITIVE PROFILES

Rothen, N.^{1,2} & Ovalle Fresa, R.^{1,2}

1 University of Bern, Bern, Switzerland; 2 Swiss Distance Learning University, Brig, Switzerland

Presenting author: Rothen Nicolas

Synaesthesia is associated with extraordinary experiences elicited in the presence of an appropriate inducing stimulus. For instance, in grapheme colour synaesthesia (GCS) an achromatic letter may elicit a highly specific colour experience. Previous studies reported enhanced colour perception in GCS and other studies provided empirical evidence for enhanced colour memory in GCS. This led to the suggestion that enhanced perceptual processing in synaesthesia may be responsible for enhanced memory performance. However, perceptual processing and memory performance has never been directly compared in a single study. Thus, it was our primary goal to compare perceptual processing and memory performance in a group of GCS, non-synaesthetic colour experts (NCE) and non-synaesthetic controls (NSC). GCS and NCE outperformed NSC in both, perceptual processing and memory tasks, while GCS and NCE showed similar performance in both tasks. We conclude that enhanced memory performance in GCS and NCE is associated with enhanced perceptual processing.

OS1.CIB.5 HOW LANGUAGE SHAPES CATEGORICAL PERCEPTION OF EVERYDAY OBJECTS: ELECTROPHYSIOLOGICAL EVIDENCE IN SPANISH-ENGLISH BILINGUALS AND MONOLINGUAL CONTROLS

Casaponsa, A.¹, García-Guerrero, A.², Martínez, A.³, Thierry, G.⁴, & Athanasopoulos, P.¹

1 Lancaster University, UK; 2 University of Deusto, Spain; 3 Valladolid University, Spain; 4 Bangor University, UK.

Presenting author: Aina Casaponsa

Languages label categorical distinctions differently. Learning a new language thus entails internalizing new categorical boundaries. Here, we investigate the neural correlates of categorical perception of objects that might arise from differences in terminology between languages and categorical restructuring in the bilingual mind. Twenty Spanish-English bilinguals, 20 English monolinguals, and 20 Spanish monolinguals performed a visual oddball detection task whilst objects were presented in the peripheral visual field. Object categories differed based on terminology between Spanish and English: 'taza' = mug + cup, 'copa' + 'vaso' = glass. Whilst monolinguals showed increased visual mismatch negativity (vMMN) for categorical contrasts distinguished by their L1, bilinguals showed a vMMN increase for categories distinguished by either language. We conclude that categorical perception of objects is not only shaped by

the native language but is also subject to plasticity associated with the learning of a new language.

OS1.CIB.6 THE QUEST FOR FAST MODULATION OF COLOUR PERCEPTION BY LANGUAGE OF OPERATION: GEARING UP TOWARDS PRE-REGISTRATION

Thierry, G.¹, Mortimore L.¹, Casaponsa, A.², Tomoschuk, B.³, Wu, Y.J.⁴, & Athanasopoulos, P.²

1 Bangor University, Wales; 2 Lancaster University, UK; 3 University of California, San Diego (UCSD), USA; & 4 Ningbo University, China.

Presenting author: G. Thierry

We previously tested whether the existence of two basic colour terms for blue in Greek, ghalazio ('light blue') and ble ('dark blue'), lead to a greater perceptual contrast in Greek than English speakers (Thierry et al., 2009). Since our initial observations of the predicted interaction between language group and colour (blue, green) on visual mismatch negativity (vMMN) amplitude, we have sought to test whether colour perception can be modulated by language of operation within the same Greek-English bilinguals. Here, participants made semantic decisions on centrally presented Greek or English words whilst 4 coloured squares were flashed parafoveally within an oddball sequence. We expected greater vMMN for blue than green contrasts in the Greek but not the English context. We found a vMMN modulation but failed to observe the critical colour by language interaction. We will pre-register the next iteration using auditory instead of visual words to set the language context.

OS1.CIB.7 WHAT CAN CONTINUOUS RESPONSES TELL US ABOUT PHONEME CATEGORIZATION?

Kapnoula, E.C.¹ & McMurray, B.²

1 Basque Center on Cognition, Brain and Language (BCBL), Spain; 2 University of Iowa (UI), USA

Presenting author: Efthymia Kapnoula

Listeners map continuous acoustic information into distinct phoneme categories. To study this process, we routinely collect binary responses (e.g., in 2AFC tasks) and use categorization slope as a measure of categorization quality. However, a plethora of findings shows that listeners are sensitive to within-category acoustic differences and capturing this sensitivity using binary responses is problematic; a shallower categorization slope could reflect a more gradient mode of perception, or inconsistent categorization (noisy/poor speech perception). We present a behavioral paradigm that allows us to measure gradient activation of phoneme categories in a more direct way. As

reported by Kapnoula et al (2017), this measure is not correlated with consistency of binary responses, meaning that it assesses a different aspect of phoneme categorization than that assessed by 2AFC-type tasks. Furthermore, our measure is validated by EEG data showing that sensitivity to within-category differences can be traced back to early processing of acoustic information.

OS1.CIB.8 FUNCTIONAL HIERARCHY FOR TACTILE PROCESSING IN THE VISUAL CORTEX OF SIGHTED ADULTS: CHRONOMETRIC TMS (TRANSCRANIAL MAGNETIC STIMULATION) STUDY

Matuszewski, J.¹, Bola, Ł.^{1,2,3}, Kossowski, B.¹, Banaszkiewicz, A.¹, Paplińska, M.⁴, Szwed, M.², Jednoróg, K.¹, Dragan-ski, B.⁵, & Marchewka, A.¹

1 Nencki Institute of Experimental Biology of Polish Academy of Sciences, Poland; 2 Jagiellonian University, Poland; 3 Harvard University, USA; 4 University of York, UK; 5 Academy of Special Education, Poland

Presenting author: Jacek Matuszewski

Perception via different senses was thought to be supported by separate brain systems. However, studies show

that the visual cortex in typical, sighted adults can be involved in tactile perceptual processing. Here, we investigated the spatio-temporal dynamics of this involvement during tactile Braille reading. Sighted Braille readers read single letters tactually. During reading, TMS was applied to their early visual cortex, visual word form area (VWFA) and early somatosensory cortex, at five time windows from 20 to 520ms after Braille letter presentation. Subjects' accuracy decreased when TMS was applied to the early visual cortex, 120-220ms after the Braille letter presentation, and when it was applied to the VWFA, 320-420ms after the Braille letter presentation. Our results indicate that, in sighted people, the involvement of the visual cortex in tactile perception follows canonical visual hierarchy and suggest that visual cortex might support spatial perception in a task-specific sensory-independent manner.

Estambul Room

Language Processing I

OS1. EST.1 TRANPOSED-WORD EFFECTS IN THE SAME-DIFFERENT MATCHING TASK

Pegado, F.¹ & Grainger, J.²

Aix-Marseille University, France

Presenting author: Felipe Pegado

To probe the position code for word order during reading, two sequences of five words (the reference and the target sequences) were briefly presented one after the other in a same-different matching task. The reference sequence could be grammatically correct or incorrect (scrambled order). We manipulated the nature of the target sequence by repeating, replacing or transposing words. In Experiment 1, 'same' responses were easier with grammatically correct sequences, and 'different' responses were much harder for transposed than replaced words. This transposed-word effect was found to be independent of the grammaticality of the reference. Experiment 2 introduced a delay of one second between the reference and target and replicated the findings. Our data suggest a noisy bottom-up association of word identities to word location in a line of text, a process that requires a certain amount of parallel processing of words and that remains active over a short delay.

OS1. EST.2 THE EFFECT OF SEMANTIC DIVERSITY ON SERIAL RECALL FOR WORDS

Hsiao, Y., Mak, M.H.C., & Nation, K.

University of Oxford, UK

Presenting author: Yaling Hsiao

We investigated whether semantic diversity (SemD) influences immediate serial recall for words. SemD was calculated using LSA to quantify the degree of semantic similarity in the contexts a word appears across a large corpus. Word lists were formed of high vs. low diversity words. SemD was crossed with imageability. Words were presented visually in serial order, and 40 participants recalled the list in correct order. There was no main effect of imageability or SemD, but SemD was modulated by list position and imageability. Among high-imageability words, more high-SemD words were recalled in the first position. In contrast, more low-SemD words were recalled in the second

half of the list, again only in the high-imageability condition. These findings suggest that the availability of more semantic connections privileges recall for high-SemD words in terms of the primacy effect, but induces more competition between items later on in serial recall.

OS1. EST.3 EXPLORING SEMANTIC VARIABLES IN LANGUAGE PRODUCTION: BEHAVIOURAL AND ELECTROPHYSIOLOGICAL EVIDENCE

Lampe, L.^{1,2}, Bürki, A.³, Hameau, S.¹, Fieder, N.⁴, & Nickels, L.¹

1 Macquarie University, Australia; 2 International Doctorate for Experimental Approaches into Brain and Language (IDEALAB), Universities of Groningen (The Netherlands), Newcastle (United Kingdom), Potsdam (Germany), Trento (Italy) & Macquarie University

Presenting author: Leonie Lampe

In word production, word meaning is accessed before form selection. We extend previous work that has suggested that item-inherent aspects of meaning (semantic variables) can have effects on word production in opposing directions, which some authors attribute to different levels of processing: facilitation via conceptual overlap and inhibition via lexical competition. We simultaneously examine six feature-based semantic variables (number of near semantic neighbours and features, semantic similarity, typicality, intercorrelational density, distinctiveness). This work informs theory by (1) clarifying and dissociating effects of these semantic variables on word production; and (2) studying their temporal dynamics using EEG. Response times, naming accuracy, and EEG data is being collected for 40 subjects naming 297 pictures. We will determine the effects of the semantic variables on behavioural measures and mean EEG amplitude, while controlling for other psycholinguistic variables. Results will be presented and implications for semantic and word production models will be discussed.

OS1.EST.4 HOW WELL DO WORD RECOGNITION MEASURES CORRELATE? EFFECTS OF LANGUAGE CONTEXT AND REPEATED PRESENTATIONS

Dirix, N., Brysbaert, M., & Duyck, W.

Universiteit Gent

Presenting author: Nicolas Dirix

We assessed the extent to which different word recognition time measures converge, using large databases of lexical decision times and eyetracking measures. We observed a low proportion of shared variance between these measures, which limits the validity of lexical decision times to real-life reading. A second analysis of two different eyetracking corpora compared the eyetracking reading times for short paragraphs with those from reading of an entire book. Our results revealed that the correlations between eyetracking reading times of identical words in two different corpora are also low, suggesting that the higher-order language context in which words are presented plays a crucial role. Finally, our findings indicate that lexical decision times better resemble the average processing time of multiple presentations of the same word, across different language contexts.

OS1.EST.5 PREDICTIONS OF A NEW MODEL OF READING

Snell, J. & Grainger, J.

Aix-Marseille University, France; CNRS, France

Presenting author: Joshua Snell

Reading research has long endorsed the view that words are processed strictly one-by-one. A primary pillar of this notion is the absence of certain influences from upcoming words on readers' eye movements. Here we assert that the field has followed an inappropriate rationale, and that inferences about the reading system warrant treading beyond the methodological scope of eye movements in sentence reading. Recent considerations of how the system organizes linguistic input have led to the development of a new model of reading, OB1-reader. This model has sparked fresh predictions in- and outside the realm of text reading, with ensuing research begging refutation of the seriality assumption. Here we will highlight some key phenomena in support of the model, and, more generally, parallelism: sentence superiority effects and flexible word position coding. It will become clear that both theoretically and methodologically, reading research is ready for a paradigm shift.

OS1.EST.6 SIMULATING NAMING, LEXICAL DECISION AND PROGRESSIVE DEMASKING WITH BRAID-PHON, A BAYESIAN MODEL OF READING ALOUD

Saghiran, A., Diard, J., & Valdois, S.

LPNC, CNRS, Université Grenoble Alpes, France

Presenting author: Ali Saghiran

Within a Bayesian modeling framework, we propose BRAID-Phon, a new computational model of expert reading, in which cognitive tasks are mathematically expressed and simulated using Bayesian inference. The model incorporates a fully described word recognition model. Beyond orthographic and phonological knowledge, it includes two visual components (i.e., the acuity gradient and lateral interference between letters) and a visuo-attentional component in which a visuo-attentional distribution modulates sensory information processing. We show that attentional control allows reading words and non-words, in a single-route architecture. In this study, we use the BRAID-Phon model to simulate three cognitive tasks: word naming, lexical decision and progressive demasking. The model's behavior is compared with observations from the Chronolex dataset: we analyze predicted reaction times and specific effects related to some psycholinguistic variables (e.g., effect of the initial phoneme, or orthographic and phonological distance to neighbors) and differential length effects depending on the task.

OS1.EST.7 SLEEP DEPRIVATION DOES NOT PREVENT LEARNING AND GENERALISATION OF A NEW ARTIFICIAL SCRIPT

Tamminen, J., Newbury, C.R., Vinals, L.I., Crowley, R., Cevoli, B., & Rastle, K.

Royal Holloway University of London (RHUL), UK

Presenting author: Chloe Newbury

Sleep-dependent memory consolidation contributes to language acquisition and generalisation of linguistic knowledge. Effects of sleep deprivation on these processes are however unexamined. Adult participants learned pseudowords in an artificial script to investigate whether general linguistic knowledge is affected by sleep deprivation before encoding (Experiment 1) and post-encoding (Experiment 2). Acquisition of trained words was assessed with a recognition task and reading and spelling of trained words. Reading and spelling of untrained words assessed generalisation, and knowledge of letter-phoneme mappings assessed memory for linguistic rules. Sleep deprivation did not consistently impair recognition, reading, or spelling, although correct responses in the recognition task were slower with post-encoding sleep deprivation. This demonstrates little impact on language acquisition and generalisation. Explicit knowledge of letter-phoneme

mappings was impaired, suggesting that the impact of sleep deprivation may be restricted to explicit memory for linguistic rules, and does not affect the application of those rules in reading.

OS1. EST.8 LEARNING MORPHOLOGICALLY COMPLEX SPOKEN WORDS: ORTHOGRAPHIC EXPECTATIONS OF EMBEDDED STEMS ARE FORMED PRIOR TO PRINT EXPOSURE

Beyersmann, E.¹, Wegener, S.¹, Nation, K.², Prokupczuk, A.³, Wang, H.-C.¹, & Castles, A.¹

1 Macquarie University, Australia; 2 University of Oxford, UK; 3 University of Leipzig, Germany

Presenting author: Elisabeth Beyersmann

It has recently been suggested that orthographic predictions of newly learned spoken words are generated prior

to print exposure. Here we ask if the information that is available in spoken words goes beyond the mappings between phonology and orthography. Adults were taught the oral form of morphologically complex words ('bypes', 'byping', 'byped'), consisting of a novel stem ('bype') and an existing inflectional affix ('-s', '-ing', '-ed'). Half of the stems had a predictable, half an unpredictable spelling. Following oral training, participants saw the printed form of novel stems for the first time. Word stems (half trained, half untrained) were embedded in sentences, and eye movements were monitored. Reading times were shorter for trained than untrained stems, and for stems with predictable than unpredictable spelling. Crucially, there was an interaction between spelling predictability and training, suggesting that orthographic expectations of embedded stems are already formed during spoken word learning.

Atenas Room

Emotion

OS1.ATE.1 AUTONOMIC AND MUSCLE ACTIVATION IN RESPONSE TO AUDITORY WORDS: THE ROLE OF AFFECTIVE PROPERTIES AND CONCRETENESS

Marelli, M.^{1,2}, Vergallito, A.^{1,2}, Petilli, M.A.^{1,2}, & Cattaneo, L.³

1 University of Milano-Bicocca, Italy; 2 NeuroMI, Italy; 3 University of Verona, Italy

Presenting author: Marco Marelli

The present study investigates to what extent the autonomic system is involved in linguistic processes. 500 Italian words were auditorily presented to 20 native speakers. Changes in heart rate were measured during the passive listening of words. Automatic activation of facial muscles was also registered. Experimental stimuli were selected to vary for affective properties (valence, i.e. the degree of positivity of the word, and arousal, i.e. the amount of emotional activation brought by the word) and concreteness. These three variables were found to interact in predicting both heart rate and facial muscle activity. The results provide evidence for the involvement of the autonomic system in word processing. This involvement depends on affective aspects, however it is mostly observed for abstract words, in line with proposals postulating that emotions play a central role in the grounding of abstract concepts.

OS1.ATE.2 THE MECHANISMS OF SOURCE REVALUATION IN EVALUATIVE CONDITIONING

Balas, R., Sarzyńska, J., Taraday, M., Łakuta, P., Rosocha, A., & Osęka, L.

Institute of Psychology Polish Academy of Sciences

Presenting author: Adriana Rosocha

Evaluative conditioning (EC) is defined as a change in object's evaluation due to its repeated pairing with an affective stimulus (an US). Although EC effects are robust and well-replicated the attributes and mechanisms of evaluative learning are under constant dispute. The presented research (N = 240) refers to an impact of US revaluation on conditioned response to paired CS. We aimed to see if CS-US associative strength and propositional knowledge both moderate US revaluation. To do that we manipulated two factors: a) US revaluation strength and b) the way US

revaluation was presented (repeated exposures vs instruction). The results indicate that stronger revaluation of US generates stronger CS change. Moreover, revaluation with repeated exposures is more effective than revaluation based on verbal instruction. These results suggest interdependent mechanisms of EC: associative and propositional.

OS1.ATE.3 REGULAR EXERCISE IS ASSOCIATED WITH GREATER ABILITY TO CONTROL NEGATIVE EMOTIONS: AN ERP EVIDENCE

Ligeza, T.S., Kałamała, P., Tarnawczyk, O., Maciejczyk, M., & Wyczesany, M.

Jagiellonian University in Krakow, Poland

Presenting author: Tomasz S. Ligeza

The study aimed to investigate the relationship between the frequency of physical exercise and the ability to control negative emotions in adult women. We assessed 26 frequently active and 26 infrequently active adult women using behavioral and electrophysiological measures during an emotion regulation task. To control negative emotions, participants were trained in reappraisal, a cognitive strategy which involves reinterpretation of emotional stimuli (here negative emotional pictures). Although no significant effects were observed in the case of behavioral results, some of the late positive potential (LPP, an electrophysiological marker of emotional response) showed that the more frequently active group displayed better efficacy of negative emotion regulation (i.e., greater difference in response to reinterpreted vs passively watched negative pictures). The study suggests that frequent physical activity may lead to better efficacy of controlling negative emotions in women.

OS1.ATE.4 IN SEARCH OF EFFECTS SPECIFIC TO COGNITIVE CHANGE DURING REAPPRAISAL: A MAGNETOENCEPHALOGRAPHY STUDY

Wyczesany, M.¹, Ligeza, T.S.¹, Wiens, N.², & Junghöfer, M.²
1 Jagiellonian University in Krakow, Poland; 2 University of Münster

Presenting author: Mirosław Wyczesany

Reappraisal is an emotion regulation strategy, based on the cognitive change (modifying the interpretation of affective stimuli). However, before the cognitive change can occur, reappraisal requires effortful elaboration of emotional stimuli. As such, cognitive effort itself can lower intensity of emotional reactions. In the study, we aimed at isolating effects specific to cognitive change from unspecific effects of cognitive effort. Participants were trained in either a reappraisal task, or a cognitive elaboration task without the cognitive change during negative pictures presentation. Using magnetoencephalography and source analysis we found that brain activations associated with emotional processing were indistinguishable across the two groups shortly after picture onset (<300ms). However, at a later time (300-600ms) the reappraisal group showed greater reduction of visual cortex activity in response to negative stimuli. The results suggest that the effect specific to cognitive change are observed relatively late and are preceded by unspecific effects of cognitive effort.

OS1.ATE.5 THE NEURAL CORRELATES OF EMOTIONAL FLEXIBILITY: FMRI STUDY

Biró, B.¹, Cserjési, R.¹, & Kökönyei, G.Y.^{1,2}

1 Eötvös Loránd University, Budapest, Hungary; 2 Semmelweis University Budapest, Hungary

Presenting author: Brigitte Biró

The ability to effectively shift between different emotions can reduce negative affects, stress and depression while enhancing communication and positive emotions. Therefore, we aimed to develop a new task to measure how a person can shift between emotional valences (negative and positive) when the context changes. Thirtysix healthy people participated in our study. Whilst performing the Emotional Shift Task (EST) fMRI technique was used. The EST consists of pairs of pictures. In each pair the first picture is always a detail from the second (whole) picture. The valence of the firstly presented detail changes when it is placed into a context and so should change the elicited emotion. The reaction time and the number of the correct answers were also registered. Based on the literature working with the same interests as our, we hypothesized that the amygdala, insula, ACC, dmPFC, and striatal regions would be activated when shifting.

OS1.ATE.6 NEURONAL NETWORKS FOR MINDFULNESS ACCEPTANCE AND COGNITIVE REAPPRAISAL IN MAJOR DEPRESSIVE DISORDER? AN FMRI STUDY OF EMOTION REGULATION

Kulesza, M.¹, Rękawek, K.², Holas, P.², Żołnierczyk-Zreda, D.³, Poleszczyk, A.⁴, Sokół-Szawłowska, M.⁴, Marchewka, A.¹, & Wypych, M.¹

1 Nencki Institute of Experimental Biology of Polish Academy of Sciences, Poland; 2 University of Warsaw, Poland; 3 Central Institute for Labour Protection? National Research Institute, Poland; 4 Institute of Psychiatry and Neurology, Poland

Presenting author: Maria Kulesza

Emotion regulation (ER) is disrupted in major depressive disorder (MDD), causing variety of emotional problems such as ruminative negative thinking. Here, we administered two ER strategies – mindfulness acceptance (MA), focused on being aware to “here and now”, and cognitive reappraisal (CR), based on reinterpreting emotionally negative stimuli. Currently depressed patients (n=66) underwent 30min training in both strategies and were asked to use them alternately during fMRI procedure. Comparison of MA and CR to control condition showed distinct neuronal signatures. MA engaged insula, angular gyrus (AG), posterior cingulate cortex (PCC) and precuneus - regions related to processing information about the self. CR showed activations in AG, thalamus, PCC, superior and middle frontal gyri – regions involved in e.g. working memory and inward attention. This shows that both strategies could be distinguished on neuronal level in MDD, involving brain regions normally active in healthy people during ER tasks.

OS1.ATE.7 THE INNER COMPONENTS OF THE AESTHETIC EXPERIENCE

Bechi Gabrielli, G.¹, Giulietti, G.¹, Mastandrea, S.², Biasci, V.², Bozzali, M.^{1,3}, & Fagioli, S.^{1,2}

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Presenting author: Giulia Bechi Gabrielli

Background: Aesthetic judgment is biased by context and emotional content. We investigated the relationship between internal features of aesthetic experiences (attention, emotion, understanding) and aesthetic judgment. Method: 23 art-naïve participants performed an affective misattribution task. They judged pleasantness of neutral stimulus preceded by positive, negative and neutral artistic and non-artistic pictures. Participants were administered

with Aesthetic Experience Questionnaire (AEQ). T1-3D images were acquired for ten participants through 3T-MRI scanner.

Results: Positive pictures liked more, irrespective of artistic context. Positive bias towards negative artistic pictures was associated with the attentional dimension of aesthetic experience. Imaging analysis revealed a negative correlation between cortical gyrification and AEQ empathetic dimension in right middle temporal gyrus, SMA and paracentral lobule.

Discussion: Enjoying sadness in visual art depends on attentional dimension of aesthetic experience. Moreover, aesthetic experience was mediated by cortical complexity: less complexity of attentional areas was related to an empathic approach of artwork.

OS1.ATE.8 SETTING THE ALARM WHILE YOU SLEEP

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1 University of Exeter, United Kingdom; 2 Basque Center on Cognition, Brain and Language (BCBL), Spain

Presenting author: Nicolas Dumay

This study examined whether new alarming words require sleep to hijack attention. Participants learnt two sets of associations between made-up words ('drott') and alarming or neutral pictures ('a dead sheep' vs. a 'munching cow') 12 hours apart. The Sleep participants learnt Set-1 words at 8 pm, whereas the Wake participants learnt them at 8 am. Acquisition was easier in the morning, but alarming and neutral associations had similar learning rates. Stroop colour classification administered after learning Set 2 showed hints of immediate emotional interference, but a robust effect only after sleep and no effect after wake. An auditory analogue involving pause detection showed the same interference, again only after sleep. Meanwhile, speeded recognition showed more reminiscence after sleep, and in that case, faster latencies for alarming words, thus confirming attentional capture. In sum, sleep (or some associated act) gives alarming words the power to hijack attention in the long term.

St Tropez Room

Multitasking

OS1.StT.1 ATTENTIONAL FLEXIBILITY IS IMBALANCED: ASYMMETRIC COST FOR SWITCHES BETWEEN EXTERNAL AND INTERNAL ATTENTION

Verschooren, S., Liefvooghe, B., Brass, M., & Pourtois, G.
Ghent University

Presenting author: Sam Verschooren

Whereas the effects of attention switches occurring within perception or memory are relatively well understood, much less is known about switches of attention between them. We present here a new paradigm, in which participants performed a simple probe-to-target matching task where targets were either perceived on screen or accessed in working memory. Across successive trials, repetitions or alternations (in both directions) between these two conditions were created, and eventually compared to each other. Experiment 1 revealed an asymmetric cost, being substantially larger when switching from (external) perception to (internal) memory than the other way around. In Experiments 2-4, we ruled out an imbalance in practice, learning, and preparation as alternative interpretations for this asymmetry. We provide an initial proposal towards explaining this robust finding, but further research will be necessary to meet this challenge.

OS1.StT.2 CAN PARTICIPANTS FLEXIBLY ADAPT THEIR TASK CHOICE IN THE SELF-ORGANIZED TASK SWITCHING PARADIGM?

Kiesel, A.¹, Mittelstädt, V.¹, & Miller, J.²

1 University of Freiburg, Germany; 2 University of Otago, New Zealand

Presenting author: Andrea Kiesel

We recently proposed a variant of the voluntary task-switching procedure in which participants freely choose which task to perform, yet the stimulus for the previously performed task is presented with increasing delay depending on the number of successive repetitions. In two experiments, we assessed how flexibly participants adapt to the tradeoff between waiting time for repetition stimuli and task-switch costs when freely choosing task order. To manipulate switch costs, we varied the response-to-stimulus interval (RSI) either blockwise or trialwise. Switch rate

decreased and waiting time increased with larger switch costs in both conditions. However, the waiting times for the repetition stimulus matched the switch costs only for blockwise but not for trialwise variations of switch costs. These results suggest that people use a general strategy of preferring to switch more often when switching is predictably easier, possibly implemented by preparatory task selection processes carried out in advance of each trial.

OS1.StT.3 STRUCTURAL CONSTRAINTS AND PLASTICITY IN MULTIMODAL MULTITASKING: PRACTICING MODALITY MAPPINGS IN TASK SWITCHING

Koch, I., Fintor, E., & Stephan, D.N.

RWTH Aachen University, Aachen, Germany

Presenting author: Iring Koch

Multitasking is typically multimodal. Recent studies showed that performance costs of multitasking (e.g., when switching tasks) are smaller with modality-compatible stimulus-response (S-R) mappings. Modality compatibility (MC) refers to the similarity of the stimulus modality and the sensory response effects (e.g., speaking produces sounds, compatible with auditory-vocal mapping). We approach MC effects from a learning perspective, arguing that learnt response-effect (R-E) contingencies create mapping preferences. Therefore, we explored the influence of preceding mapping learning on task switching costs. In Study 1, we varied a MC compatible or incompatible S-R practice across groups and found a decreased MC effect with incompatible S-R practice. In Study 2, we varied compatible vs. incompatible R-E practice and found that it affects subsequent mapping preferences in a free choice condition but has no influence on task switch costs. Together, the data suggest that long-term modality mappings can be easily changed based on short-term associations

OS1.StT.4 INDUCING PREDICTION ERRORS DURING PREPARATION FOR A TASK SWITCH

Kleinsorge, T. & Scheil, J.

Leibniz Research Centre for Working Environment and Human Factors, Germany

Presenting author: Thomas Kleinsorge

We examined effects of distractor stimuli that were presented during the preparation interval of a cued task-switching procedure. These stimuli formed either a regular 3-element sequence (80 % of trials) or deviated from this sequence with respect to the last stimulus (20 %). When the distractor stimuli shared elementary features (edges, curvature, lines) with the task cues, we observed a) a negative preparation effect (larger RT and switch cost with a long as compared to a short preparation interval) and b) smaller switch costs with irregular as compared to regular sequences. Both effects were absent when the task-irrelevant stimuli consisted of features (colors) that did not overlap with the task cues. We assume that sequences of distractor stimuli with overlapping features attract attention and induce predictions of the following elements, resulting in prediction errors in case of a deviant, which in turn increase the amount of controlled processing.

OS1.StT.5 THE ROLE OF CUE SWITCHING AND TASK-PAIR SWITCHING AT THE GLOBAL LEVEL OF DUAL-TASK PROCESSING

Hirsch, P. & Koch, I.

RWTH Aachen University, Germany

Presenting author: Patricia Hirsch

By implementing task-pair switching into the psychological refractory period (PRP) paradigm, previous research showed that performance is worse in task-pair switches (e.g., task-pair 1 with Task A as Task 1 and Task C as Task 2 -> task-pair 2 with Task B as Task 1 and Task C as Task 2) than task-pair repetitions (e.g., task-pair 2 -> task-pair 2). This task-pair switch cost suggests that the identity of the individual tasks performed in a dual task is jointly represented in a single mental representation. However, since previous research used one cue per task-pair, it remains unclear whether the observed switch cost is due to the switching of task-pairs or cues. In the present study, we, therefore, used two cues per task-pair. In addition to cue switch costs, we observed task-pair switch costs, indicating that task-pair switching per se produces a cost that cannot be explained by cue switching itself.

OS1.StT.6 DISTRIBUTING ATTENTION: THE CEREBELLUM'S ROLE IN MOTOR-COGNITIVE DUAL-TASKING

Künstler, E.C.S., Klingner, C.M., Günther, A., Finke, K., Witte, O.W., & Bublak, P.

Jena University Hospital, Jena, Germany

Presenting author: Erika Künstler

Beyond coordinating movement, the cerebellum supports executive functions such as motor-cognitive dual-tasking. The precise role of the cerebellum is, however, unclear; does it integrate individual task networks into one distinct dual-task network? To test this, 26 cerebellar infarct patients and 26 healthy controls performed a visual task and a motor task. Patients showed no residual fine motor deficits. Both groups showed similar visual processing rates and visual short-term memory storage capacities in both single- and dual-task conditions, and performed comparably in the motor task in the single-task condition. However, patients were less accurate in the motor task in the dual-task condition. Resting state fMRI analyses indicated a correlation between the motor dual-task costs and the connectivity between the cerebellum and the ventral attention network in healthy controls, but not in patients. These findings suggest that the cerebellum plays a decisive role in coordinating cognitive resources across tasks during motor-cognitive dual-tasking.

OS1.StT.7 A GESTALT ACCOUNT OF ACTION CONTROL: EVIDENCE AGAINST STRUCTURALISM

Huestegge, L.¹, Pieczykolan, A.², & Koch, I.²

1 Würzburg University, Germany; 2 RWTH Aachen University, Germany

Presenting author: Lynn Huestegge

Structuralist accounts of behavior are pervasive in cognitive psychology. For example, multitasking theories typically assume that dual-task processing essentially consists of two combined single-task processing streams, plus some additional mechanism to account for performance costs (e.g., prolongation/interruption of task processing stages, or altered activation/inhibition dynamics etc.). Here, this structuralist assumption is put to a test by having participants switch between single and dual action demands. We did neither observe partial repetition benefits nor costs. Instead, dual action demands appeared to be represented similar to a third action demand, unrelated to its two components. We interpret these observations by proposing a Gestalt view of action control.

OS1.StT.8 INFLUENCE OF POSTURAL CONTROL DEMAND
ON COGNITIVE CONTROL IN TASK SWITCHING - SHOULD
WE SIT OR SHOULD WE STAND

Stephan, D.N. & Koch, I.

RWTH Aachen University, Germany

Presenting author: Denise Nadine Stephan

In the current study we investigated postural control on cognitive control processes in task switching. The study was conducted using cued auditory-manual task switching under different postural control demands (sitting vs. standing). This design allowed us to explore the effect of postural control on switch costs, mixing costs and the between-task

congruency effect. We replicated these standard effects in task switching in all experiments. Importantly, we demonstrated a selective effect of postural control demands in task switching in terms of an increased congruency effect when standing as compared to sitting. This finding suggests that particularly in situations that require keeping two tasks active in parallel, the postural control demands have an influence on the degree to which cognitive control enforces a more serial (shielded) mode. Our results will also be discussed considering the specific influence of stimulus modality (auditory vs. visual) contrasting another current study which used visual-manual task switching.

Tarraco Room

Action

OS1.TAR.1 CONFLICT ADAPTATION FOLLOWING ACTION OBSERVATION

Cracco, E.¹, Braem, S.², & Brass, M.¹

1 Ghent University, Belgium; 2 Vrije Universiteit Brussel, Belgium

Presenting author: Emiel Cracco

Research suggests that we can represent the actions of multiple observed agents in our own motor system. However, it remains unclear how we process observed actions that we cannot simultaneously execute. In recent work, we found that observing such actions activates brain regions associated with motor conflict, suggesting that not only planning but also observing conflicting actions elicits conflict. Here, we ask whether experiencing motor conflict during action observation leads to conflict adaptation. To test this hypothesis, we did two experiments in which participants performed a prime-probe task, after observing either two identical or two different actions. Both experiments revealed a reversed conflict adaptation effect, with larger prime-probe congruency effects after observing two different compared with two identical actions. This is consistent with the adaptation by binding theory of conflict adaptation and suggests that observing conflicting actions modulates cognitive control on unrelated tasks.

OS1.TAR.2 CEREBELLAR CONTRIBUTION TO BODY PROCESSING REVEALED BY NON-INVASIVE BRAIN STIMULATION

Cattaneo, Z., & Ferrari, C.

University of Milano Bicocca, Milano, Italy

Presenting author: Zaira Cattaneo

Growing evidence suggests that the cerebellum contributes to cognitive, affective and social processing. We will present a series of TMS experiments in which we investigated the possible causal contribution of different cerebellar sectors to processing of socially-relevant information, such as biological motion and emotions conveyed by body postures. In a first study, TMS applied over the cerebellar vermis interfered with participants' ability to discriminate biological motion. In a following study, we extended the investigation to the role of the cerebellum in body emotion

processing, prior neuroimaging evidence suggesting that the left cerebellum may be particularly important for affective processing. We found that (left) cerebellar TMS interfered with body emotion discrimination – supporting prior TMS data on facial emotion processing - but only when the emotion expressed was negative (anger). Overall, our findings point to a critical role of the cerebellum in social and affective processing, with important clinical implications.

OS1.TAR.3 USE OF CONTEXTUAL PRIORS DURING ACTION PREDICTION IN CHILDREN: THE ROLE OF THE CEREBELLUM.

Urgesi, C.^{1,2}, Butti, N.², Amoruso, L.³, Finisguerra, A.², Romaniello, R.², & Borgatti, R.²

1 University of Udine, Italy; 2 Scientific Institute, IRCCS E. Medea, Italy; 3 Basque Center on Cognition, Brain and Language (BCBL), Spain.

Presenting author: Cosimo Urgesi

Understanding others' behaviors involves matching social expectations with perceived movement kinematics. Here, we investigated the role of the cerebellum in action understanding by comparing children (N=17) with congenital cerebellar malformations to age- and IQ-matched children (N=17) with other congenital neurodevelopmental disorders and to children with typical development (N=17). In a familiarization phase, participants were exposed to videos showing a child actor performing two different actions, which were associated to specific contextual cues with pre-established probability of co-occurrence. In a testing phase, participants had to predict the final outcome of the same actions presented in conditions of kinematic ambiguity, thus likely using the contextual priors acquired during the familiarization phase. Differently than both control groups, the responses of cerebellar patients were not biased toward these contextual priors, suggesting that cerebellar alterations may cause specific impairments in the probabilistic learning of contextual priors, with consequence on motor, cognitive and socio-emotional development.

OS1.TAR.4 GET READY FOR SELF-CONTROL: MIDFRONTAL THETA OSCILLATIONS ARE NEEDED FOR REACTIVE, BUT NOT PROACTIVE NEURAL ADJUSTMENTS DURING BEHAVIOURAL CONFLICTS

Kaiser, J. & Schütz-Bosbach, S.

Ludwig-Maximilian-University Munich, Germany

Presenting author: Jakob Kaiser

Successful self-control during action conflicts relies on neural adjustments of motor and sensory processing. These adjustments can occur reactively (i.e., after conflict occurrence) or proactively (i.e., in preparation prior to conflicts). While midfrontal theta oscillations are known to facilitate reactive top-down control, their relevance for proactive control is unclear. Using EEG ($n = 33$), we investigated the role of midfrontal oscillations during conflict preparation in a motor conflict task, where a predictive cue either indicated no or an increased likelihood for an action conflict. Increased conflict likelihood led to a preparatory modulation of neural oscillations related to both motor processing (central beta) and sensory processing (posterior alpha). While midfrontal control oscillations significantly increased after conflict occurrence, increased conflict likelihood did not lead to preparatory midfrontal theta increases. This dissociation suggests that, while midfrontal oscillations are related to reactive conflict adjustments, proactive neural adjustment can be implemented without midfrontal oscillatory control.

OS1.TAR.5 CONTRIBUTION OF PERCEPTUAL AND SENSORIMOTOR INFORMATION TO PROSPECTIVE ACTION JUDGEMENTS

Geers, L., Pesenti, M., Vannuscorps, G., & Andres, M.

Université catholique de Louvain (UCLouvain), Belgium

Presenting author: Laurie Geers

The present research aims to study the processes underlying judgements about one's ability to perform an action, which is considered as a fundamental aspect of adaptive behaviour. In a series of experiments, we asked participants to make prospective grasping judgements and we manipulated perceived object size using the Ebbinghaus illusion (a central circle surrounded by small/large circles) and hand posture using concurrent motor tasks. We showed that (1) largeness vs. smallness illusion and squeezing vs. spreading fingers led participants to underestimate their ability to grasp the central circle (2) the motor task influenced grasping judgements only when the exact same effectors were involved and (3) hand posture did not influence grasping judgements when no illusion distorted perceived size, suggesting that integration of sensorimotor information is weighted on the uncertainty introduced by the illusion (Experiment 3). We concluded that

action judgements rely on the interaction of perceptual, cognitive and motor processes.

OS1.TAR.6 TRACKING THE EMERGENCE OF DECLARATIVE AND PROCEDURAL REPRESENTATIONS IN FRONTOPARIETAL CORTICES DURING THE IMPLEMENTATION OF NOVEL TASK SETS

González-García, C., Formica, S., Wisniewski, D., & Brass, M.
Ghent University, Belgium

Presenting author: Carlos González-García

An astonishing aspect of cognitive flexibility concerns the ability to rapidly transform complex symbolic instructions into novel behaviors. Previous research proposes that this process is supported by two differentiated neurocognitive states, namely, the mere maintenance of task (declarative) knowledge, and the subsequent activation of an action-oriented (procedural) state. However, direct evidence for such distinction is still lacking. We conducted an fMRI study in which participants had to encode and execute novel rules at the beginning of each trial. We then implemented a canonical template tracking procedure to capture the emergence of these rules, in a procedural and in a declarative format, before execution. This analysis revealed that, prior to execution, unique and differentiated declarative and procedural representations emerged in frontoparietal areas. Our results provide, for the first time, evidence of independent states supporting task control and shed light on the mechanisms involved in the rapid implementation of novel instructions.

OS1.TAR.7 EVENT COMPLETION DESPITE TEMPORAL ELLIPSES

Papenmeier, F.¹, Huff, M.², & Gäbele, C.¹

1 University of Tübingen, Germany; 2 German Institute for Adult Education, Bonn, Germany

Presenting author: Frank Papenmeier

During the comprehension of dynamically unfolding events – such as when watching a soccer game – observers regularly fill in perceptual gaps with information that was causally implied but actually missing in the perceptual stream. With our present research, we investigated the influence of temporal ellipses on this so-called event completion effect. Participants watched short soccer video clips and performed a contact detection task for a critical moment of ball contact that was present in 50% of trials. Following this critical moment, a filmic cut appeared and we manipulated the continuation of the clip: causal continuation without ellipses (ball starts flying), half-event ellipsis (ball in the middle of the pass), full-event ellipsis (ball contact with

next player), or non-causal continuation (e.g., players moving during a stoppage of the game). We observed event completion in all three causal continuation conditions irrespective the temporal ellipses, indicating that completion is robust against short temporal ellipses.

OS1.TAR.8 NEURAL DYNAMICS SUPPORTING HABIT ACQUISITION AND ADJUSTMENT USING IMPLEMENTATION INTENTIONS

van de Vijver, I. & de Wit, S.

University of Amsterdam, the Netherlands

Presenting author: Irene van de Vijver

Goal-directed behavior is guided by the anticipation of a desired outcome, whereas extensive repetition can turn instrumental actions into outcome-insensitive habits. The use of implementation intentions (concrete 'if-then' plans)

may help to overcome habits. In the current study we investigated, first, changes in neural interactions within and between brain areas with increasing habit formation, and second, differences in these interactions during subsequent behavioral adjustment supported by implementation versus goal intentions. We measured EEG while participants performed an outcome-revaluation paradigm, the Sneaky Skateboard Game. After outcome revaluation, participants formulated implementation or goal intentions. Preliminary results suggest that implementation intentions indeed aided behavioral adjustment, especially during trials that required making (as compared to suppressing) a response. At the neural level, we predict decreasing fronto-posterior and increasing visuo-motor connectivity with habit formation. Similarly, we expect that using implementation intentions evokes increased visuo-motor communication, and decreased frontal conflict-related signals after outcome revaluation.

Barcelona Room

Attention

OS1.BAR.1 ATTENTION DEFICITS IN SCHIZOPHRENIA: ALTERED RESISTANCE TO INTERFERENCE, INCREASED SENSITIVITY TO COGNITIVE LOAD, OR BOTH?

Michael, G.A.¹, Dorey, J.-M.^{2,3}, D'Amato, T.^{2,3}, Fabre, D.³, & Padovan, C.³

1 Université Lyon 2, France; 2 Université Lyon 1, France; 3 Centre Hospitalier Le Vinatier, France

Presenting author: George A. Michael

There is evidence that attentional and executive functions are disturbed in schizophrenia. However, recent models question the complete independence of these processes. For instance, it was suggested that inhibitory processes that subtend resistance to interference might be hierarchically dependent from available cognitive resources. Here, using a visual search task under dual tasking conditions with varying degree of difficulty, we show that patients with schizophrenia exhibit both a decreased resistance to interference (i.e., disturbed inhibitory control processes) and increased sensitivity to cognitive load (i.e., disturbed managing of attentional resources). Regression analyses also show that the two processes are completely independent from each other in patients with schizophrenia, whilst the expected hierarchical link is found in the performance of the controls. Finally, in patients, increased sensitivity to cognitive load and general response time is predictive of addictive behavior. The results pinpoint dissociable attentional processes and their role in behavior.

OS1.BAR.2 BETWEEN ATTENTIONAL AND SELF-REFERENTIAL PROCESSES: HOW DOES THE TEMPOROPARIETAL JUNCTION CONTRIBUTE TO BODY-AWARENESS?

Salgues, S., Plancher, G., & Michael, G.A.

Université Lyon 2, France

Presenting author: Sara Salgues

The temporoparietal junction (TPJ) is a multisensory integration area, contributing to many distinct cognitive processes such as attention or theory of mind. It would have a key role in self-awareness when communicating with other areas, participating in embodiment with the extrastriate body area (EBA) or self-location with the anterior insula (AI). However, as asomatognosias experiences are

affiliated with TPJ activity, it remains unclear how this massively connected area contributes to self-awareness. Resting EEG functional connectivity between the TPJ and the AI, and between the TPJ and the EBA was correlated to body-awareness assessed through spontaneous sensations (SPS). Higher connectivity within these cerebral areas was associated to lower perception of SPS over the hand, more in the TPJ-AI than in the TPJ-EBA functional connectivity. These correlations were more numerous in the alpha and theta frequency bands. The contribution to self-awareness of the TPJ, through attentional processes and asomatognosias experiences is discussed.

OS1.BAR.3 THE BIAS FOR ONE'S OWN NAME ACROSS COGNITIVE DOMAINS

Nijhof, A.D.¹, Catmur, C.¹, & Bird, G.^{1,2}

1 King's College London, United Kingdom; 2 University of Oxford, United Kingdom

Presenting author: Annabel Nijhof

Research indicates humans have a strong egocentric bias, processing self-related stimuli in a specialised, preferential manner. Although the phenomenon of self-bias is widely studied, it is also highly fractionated: different aspects of self-processing are usually studied in isolation. Consequently, it is currently unknown how self-biases are related across cognitive domains. In this study, the bias for participants' own name (versus other names) was measured across the attentional and perceptual domains, using two Attentional Blink tasks and a shape-label matching task. Strong evidence of a self-bias was found on all tasks, implicating a processing advantage for one's own name. However, self-bias estimates across the two domains were found to be unrelated, calling into question the idea of 'self-bias' as a singular concept consistent across cognitive domains. These findings may have consequences for models of self-processing generally, and for specific models of atypical self-processing such as those suggested for Autism Spectrum Disorder.

OS1.BAR.4 DOES AN ARBITRARY SELF-ASSOCIATION OF STIMULI IMPACT THE DISTRIBUTION OF ATTENTION?

Orellana-Corrales, G.¹, Matschke, C.², & Wesslein, A.K.¹
 1 Eberhard Karls Universität Tübingen, Germany; 2 Leibniz-Institut für Wissensmedien, Germany

Presenting author: Gabriela Orellana-Corrales

After geometric shapes have been associated to persons, reaction times (RT) are faster when verifying the correct self-associated shape-label pairing than any other-related pairing. We tested whether only presenting the newly self-associated shape suffices to elicit prioritization effects. After associating two shapes with themselves vs. a stranger, 28 students performed a cuing task. Participants had to indicate the location of a dot occurring either at a location previously occupied by self- vs. by stranger-related stimuli, as represented by labels vs. shapes vs. pairings (presentation for 1 s). RTs were significantly faster when the dot occurred following stranger-related stimuli as opposed to self-related stimuli, $p = .039$, likely indicating inhibition of return. This effect was not modulated by the type of representation, $p = .410$. This is original evidence that the self- vs. stranger association of geometric shapes impacts the distribution of attention even after just a short association phase.

OS1.BAR.5 CROSSMODAL NEGATIVE PRIMING BASED ON STIMULUS IDENTITY VS. LOCATION

Wesslein, A.K.¹ & Frings, C.²

1 Eberhard Karls Universität Tübingen, Germany; 2 University of Trier, Germany

Presenting author: Ann-Katrin Wesslein

Negative priming (NP) describes the finding that performance is impaired on the second of two displays (i.e., the probe), when the target stimulus is related to a distractor stimulus from the first display (i.e., the prime). In identity-based NP, participants respond to the stimulus identity and the probe target is represented by the prime distractor. In location-based NP, participants respond to the stimulus location and the probe target is presented from the same location as the prime distractor. Both identity- and location-based NP have been demonstrated in different sensory modalities. We will present a series of experiments demonstrating crossmodal identity-based NP, indicating that the mechanisms underpinning NP may function at an amodal level. Further, we will present results from a location-based study, where crossmodal as compared to unimodal NP effects were reduced. We discuss the limitations of the studies as well as their implications for NP theories.

OS1.BAR.6 EVOLUTIONARY ORIGIN OF ATTENTION

Gabay, S.

University of Haifa, Israel

Presenting author: Shai Gabay

Human cognition has an evolutionary origin. Accordingly, older evolutionary structures may play a role in cognitive processes even in humans. Nevertheless, current research in psychology and cognitive science focuses largely on the involvement of cortical regions in cognition – neglecting the potentially rich influence and participation of subcortical structures. This “cortico-centric” bias toward the involvement of cortical regions in cognition may stem from the methodological tools typically applied to study brain functioning and, most importantly, their limitations. Herein, I will present a study examining different attentional abilities of the Archer Fish. I will discuss the similarities and differences between human and fish attentional abilities and the implications of these findings on our understanding of the human attentional system.

OS1.BAR.7 INFLUENCE OF TYPICALITY IN RAPID OBJECT CATEGORIZATION IN INDIVIDUALS WITH AND WITHOUT AUTISM SPECTRUM DISORDER

Beck, A.-K.¹, Carmo, J.C.², Czernochowski, D.¹, & Lachmann, T.¹

1 University of Kaiserslautern, Germany; 2 Universidade de Lisboa, Portugal

Presenting author: Ann-Kathrin Beck

Already in 1996, Thorpe showed that healthy individuals are able to categorize items even using ultra-rapid presentations (20 ms). In individuals with autism spectrum disorder (ASD), these categorization processes may be impaired (Plaisted, 2000). This difficulty seems to be caused by abnormal categorization of atypical rather than typical items (Martinovic et al., 2008). To combine these two lines of research, in the current study we compared behavioural as well as EEG data of two different categories (food/animals) with short (33 ms) and long (83 ms) presentation rates. This discrimination task (target/no-target) was most difficult for atypical food items, specifically in high functioning individuals with ASD ($N = 14$) compared to matched controls ($N = 17$). This behavioural finding was mirrored in both early and late ERP components, suggesting that not only early categorization but also further perceptual processing processes might be affected by typicality in individuals with ASD.

OS1.BAR.8 LOW- AND MEDIUM-RATE AUDITORY STEADY-STATE RESPONSES IN DISORDERS OF CONSCIOUSNESSGórska, U.^{1,2} & Binder, M.¹*1 Jagiellonian University, Poland; 2 Donders Centre for Neuroscience, RU, The Netherlands*

Presenting author: Urszula Górska

Diagnosis of consciousness in non-responsive patients with prolonged disorders of consciousness (PDOC) remains challenging. In this study, we investigated the capacity of auditory steady-state responses (ASSRs) for this purpose. We recorded EEG from 9 unresponsive wakefulness syndrome (UWS) and 8 minimally conscious (MCS) patients

when stimulated with low- and medium-rate amplitude-modulated periodic tones: 4, 6, 8, 12, 20, 40 Hz. Next, we compared Relative Power (RP) and inter-trial Phase Coherence (PC) measures of brain response with behavioral clinical diagnosis of CRS-R scale. We observed strong positive correlations between individual total CRS-R scores and both mean PC (averaged across all stimulation rates) and 40 Hz RP measure. Additionally, these measures significantly differentiated between UWS and MCS patients' groups. Overall, low- and medium-rate ASSRs might serve as an objective estimate of the level of consciousness in PDOC. This emphasize the role of auditory system integrity in assessing brain capacity for conscious processing.

Palma de Mallorca Room

Spatial Processing

OS1.PAL.1 NAVIGATIONAL ASYMMETRIES IN A SIMULATED 3D ENVIRONMENT

Nicholls, M.E.R.¹, Gwinn, O.S.¹, Bartlett, M.L.¹, & Thomas, N.A.²

1 Flinders University, Australia; 2 Monash University, Australia

Presenting author: Mike Nicholls

The two cerebral hemispheres have different capacities for controlling spatial attention. This asymmetry is thought to cause a shift of attention towards the right side of objects located in far space – and a corresponding lack of attention to objects located on the left. As a result of this imbalance, when passing through an aperture, people veer slightly to the right of true centre. The misplacement of centre is related to pseudoneglect and occurs when walking, controlling a wheelchair and operating a toy vehicle. The current study determined whether the bias also exists in a simulated 3D environment. Right-handed participants (n=98) used a joystick to navigate through a virtual 'doorway' or 'corridor' separating two rooms. In both cases, a rightward deviation was observed. The results demonstrate that rightward deviations in the real world generalise to a virtual environment, with implications for the representation of peri- and extra-personal space.

OS1.PAL.2 PROCESSING SPATIAL CONFIGURATIONS IN VISUAL WORKING MEMORY

Timm, J.D. & Papenmeier, F.

University of Tuebingen, Germany

Presenting author: J. David Timm

Humans process single objects in relation to other simultaneously maintained objects in visual working memory – a spatial configuration. Are humans able to reorganize a global spatial configuration into a relevant partial configuration? We present three experiments investigating this process. Participants encoded objects' locations and performed a change detection task for one object probed at retrieval. This object was displaced in half of the trials. We cued the side of the object probed either during encoding or afterwards (retro-cue), allowing for the reorganization

of spatial configurations either during encoding or in working memory. At retrieval, either all objects, cued objects only, non-cued objects only or a single object were shown. Furthermore, we investigated the use of the cue and configurations themselves. We observed a reliable reorganization both when cued during encoding and also under all retro-cue conditions. Our findings provide evidence for a memory-based reorganization of spatial configurations.

OS1.PAL.3 SPATIAL LATENT PROCESSES IN VERBAL WORKING MEMORY

Guida, A., Besson, F., Lavigne, F., & Mathy, F.

University Rennes

Presenting author: Alessandro Guida

Van Dijck and Fias (2011, Cognition) showed that verbal information in working memory is spatialized. This result has been confirmed by several studies. For example, Guida, Leroux, Noël, and Lavielle-Guida (2016, Cognitive Science) presented sequences of 5 consonants in an auditory item probe recognition task. Results revealed a SPoARC (Spatial-Positional Association of Response Codes) effect interpreted as a left to right spatialization: items from the first positions triggered faster responses of the left hand, while items from the last positions triggered faster responses of the right hand. Guillermo Campitelli and I (in press, Psychonomic Bulletin & Review) have proposed a new framework to understand spatialization. Here, I will present experiments that tested left-to-right reading-participants, right-to-left reading-participants, and illiterates. These new data allow precisising the conditions under which spatialization seems to occur (or not), and I will also discuss the consequence for working memory.

OS1.PAL.4 CATCH THE STAR! SPATIAL INFORMATION ACTIVATES THE MOTOR SYSTEM

Miklashevsky, A.¹, Lindemann, O.², Fischer, M.H.¹

1 University of Potsdam, Germany; 2 Erasmus University Rotterdam, Netherlands

Presenting author: Alex Miklashevsky

Previous psycholinguistic studies have shown that grip force spontaneously changes during language processing, but effects of spatial orienting on grip force are unstudied. We induced shifts of spatial attention by presenting lateralized stars and tones or central symbols (arrows and words denoting “left” and “right”). Bimanual grip force was continuously recorded from 24 healthy adults. Star position interacted reliably with hand (at 980 ms after stimulus onset) but tone location only influenced right-hand force (already at 60 ms after stimulus onset). Left- but not right-related symbols induced strong bimanual activation (at 660 ms and 310 ms after stimulus onset for arrows and words respectively). Neuropsychological mechanisms of these asymmetries and implications for grip-force studies of language processing are discussed.

OS1.PAL.5 CROSS-MODAL CORRESPONDENCES BETWEEN TONAL STABILITY AND VISUAL SPACE: ASSOCIATING MUSICAL SYNTAX WITH SPATIAL LOCATION

Maimon, M., Lamy, D., & Eitan, Z.

Tel-Aviv University, Tel-Aviv, Israel

Presenting author: Neta Maimon

Cross-modal correspondences typically associate basic perceptual dimensions in different modalities. Here we present a new type of CMC, involving associations between a high-level, syntactic musical schema – Western music tonality – and physical space. Using explicit and implicit measures, we investigated the association of tonal stability with vertical and horizontal spatial position. Forty participants (20 musicians) took part in each of 3 experiments. In the explicit test (Exp1), participants assigned each melodic scale degree to a location on a two-dimensional grid. In two implicit association tests, auditory (tonally stable/unstable) and visual (Exp2: high/low circle; Exp3: left/right circle) stimuli were assigned to the same response keys in congruent and incongruent conditions. Stable tones were associated with spatially higher and left-hand positions both explicitly and implicitly (better performance for congruent combinations). Results suggest that musical structure may establish concrete visuospatial connotations, thus proposing a hitherto unexplored path associating syntactical configuration with connotative meaning.

OS1.PAL.6 THE ATTENTIONAL BLINK: BINARY OR GRADUAL?

Karabay, A.¹, Martens, S.¹, Wang, J.², & Akyürek, E.G.¹

1 University of Groningen, NL; 2 Shenzhen University, CHN

Presenting author: Aytaç Karabay

Identification of the second of two targets (T2) is difficult when it follows the first one within 200-500 milliseconds. This so-called attentional blink (AB) may reflect that a missed T2 fails to reach post-perceptual processing. Alternatively, T2 may still reach working memory partially, or in a degraded fashion. To arbitrate between these possibilities, we applied mixture modeling to continuous target features (e.g., orientation). If T2 does not reach post-perceptual processing, responses should be random guesses, that is, uncorrelated with the target. If the T2 representation is only degraded, then errors should cluster around the target with a certain precision. We observed notable differences in AB tasks that are spatially variable and those that are not. In non-spatial tasks, T2 identification was binary; it either did or did not reach post-perceptual processing. In spatial tasks, however, T2 identification was graded, suggesting it was represented in working memory, but with decreased precision.

OS1.PAL.7 ELECTROPHYSIOLOGICAL CORRELATES OF SPATIAL PROCESSING DURING MULTITASKING

Romeo, Z.¹, Bonato, M.², Zorzi, M.^{1,2}, & Spironelli, C.²

1 IRCCS San Camillo Hospital, IT; 2 University of Padova, IT

Presenting author: Zaira Romeo

Multitasking is ubiquitous in everyday life and has a detrimental effect on cognitive performance. In particular, multitasking has been shown to hinder spatial monitoring in both brain-damaged and healthy participants. This study investigated, in healthy adults, the electrophysiological mechanisms associated with correct vs. error responses in the detection of peripheral visual target(s) under multitasking. Results showed increased N1 amplitude under visual (intra-modal) load, whereas auditory (cross-modal) load did not induce significant modulations. Under visual load, error responses were associated to reduced N1 and N2 amplitude for the left and right visual field, respectively. Higher N1 amplitude was instead found for errors to bilateral targets. These results support the hypothesis that a threshold criterion is involved during visual information processing. They provide an electrophysiological correlate for the allocation of capacity-limited cognitive resources involved in the concurrent processing of multiple visual stimuli. Preliminary data on stroke patients is also discussed.

OS1.PAL.8 INVESTIGATING THE SHAPE OF VISUAL FIELD CAPACITY

Del Pin, S.H.^{1,2}, Sandberg, K.¹, Skóra, Z.², & Wierzchoń, M.²

1 Aarhus University, Denmark; 2 Jagiellonian University, Poland

Presenting author: Simon Hviid Del Pin

The circular array consists of displaying a central fixation surrounded by objects arranged in a circle. It is widely employed for visual experiments but does not account for systematic variance across positions. However, historical and contemporary literature indicates differences in

participant accuracy and response times depending on where an object is displayed: the horizontal axis yields higher accuracy and faster responses than the vertical axis. We first replicated these effects and found similar effects on ratings of subjective visibility which has not previously been reported. We then introduced a novel experimental paradigm, aiming to make all objects perceived evenly by adjusting the distance from the centre of 16 positions with a staircase procedure. We mathematically describe the visual space as an ellipse rather than a circle. The resulting equation can be used when designing stimulus displays as well as adding knowledge on the spatial characteristics of the visual field.

Ibiza Room

Problem Solving

OS1.IBI.1 INTENTIONAL FORGETTING IN PROBLEM SOLVING

Tempel, T.

Ludwigsburg University of Education, GERMANY

Presenting author: TobiasTempel

Two experiments on directed forgetting of problem-solving routines are reported. In Experiment 1, participants practiced solving water-jar problems (Luchins, 1942). After working on a series of problems that all could be solved by the same formula, one group was instructed to forget the so-far presented items, whereas another group did not receive a forget instruction. After practicing a different routine in a second series of problems, participants solved test problems that could be solved by the formula from the first or from the second series of problems. The forget instruction significantly reduced the application of the formula from the first series of practice problems. In Experiment 2, participants subsequently practiced two solution formulas in two series of to-be-solved anagrams. Here, a forget instruction regarding the first series of practice anagrams reduced solution speed for test anagrams that had to be solved by the same formula as the to-be-forgotten practice anagrams.

OS1.IBI.2 CHILDREN'S SPATIAL REASONING WITH VISUAL MENTAL MODEL INPUT

Demiddele, K., Heyman, T., & Schaeken, W.

KU Leuven, Belgium

Presenting author: Kevin Demiddele

This pre-registered study (cf. osf.io/c3m9t/) follows up on earlier research on children's spatial reasoning. Preceding findings revealed a strong tendency to systematically represent only one mental model by default, even when correct reasoning requires more. We tested 160 9- and 11-year-olds with 24 reasoning exercises, to find out whether they are only incapable of producing multiple representations or also lack passive understanding. Answers were multiple choice, with the choices being visual representations of mental models by means of icons, whereas earlier research used textual conclusions. As predicted, all multiple model type problems now had comparable scores,

signaling some passive understanding, although not on a par with single model problems. Also as predicted, more errors according to the 'first free fit' strategy were made. Our results, based on a mixed model analysis, specify the details of preferred mental model theory and open up a developmental perspective for it.

OS1.IBI.3 EYE MOVEMENTS INVESTIGATION OF MORAL DECISION MAKING: A FRAMING EFFECT

Indraccolo, A., Brunetti, R., & Del Gatto, C.

Università Europea di Roma, Rome, Italy

Presenting author: Allegra Indraccolo

Studying moral decision-making, psychologists showed that the conflict experienced between emotions and reasoning seems to be deep. Indeed, during a moral decision making, opposite moral principles, namely deontological and utilitarian, seem to fight to find an acceptable answer. In our study, we use moral dilemmas to highlight the conflict between these kinds of moral inclinations. We explore whether external non-moral factors could interfere with our moral beliefs. Our hypothesis is that inducing frustration or gratification by framing negatively/positively the consequences of participants' decisions, we could make them steer towards the other conflicting answer that was refused before. In three experiments, using eye tracker technology, we evaluate decision processes underlying deontological and utilitarian principles. Results are discussed in the context of the "moral flexibility hypothesis": framing the consequences of our action can produce a change in our moral values.

OS1.IBI.4 AHA! UNDER PRESSURE: IS THE AHA! EXPERIENCE CONSTRAINED BY COGNITIVE LOAD?

Van den Bussche, E.¹, Stuyck, H.^{1,2}, & Cleeremans, A.²

1 KU Leuven, Belgium; 2 Université Libre de Bruxelles, Belgium

Presenting author: Eva Van den Bussche

We can solve complex problems by an analytical, step-by-step strategy (non-insight) or by a sudden insight or Aha-

experience (insight). The underlying mechanisms of insight are debated. The business-as-usual view argues that there is nothing special about insight and that insight problem solving should similarly depend on available cognitive resources as non-insight problem solving. The special-process view proposes that insight is an implicit process and hence qualitatively different from non-insight. This implies that insight should not rely heavily on available cognitive resources. Participants received 70 word puzzles (CRAT) that could be solved both with insight and non-insight. Concurrently, we manipulated cognitive load by asking participants to remember zero, two or four numbers. Results showed that insight solutions were phenomenologically different from non-insight solutions. Crucially, increasing cognitive load slowed down non-insight, but not insight solutions. As insight was not vulnerable to cognitive load, this provides support for the special-process view.

OS1.IBI.5 WHAT TO DO AND WHAT NOT TO DO: BREAKING POSITIVELY AND NEGATIVELY FORMULATED RULES

Wirth, R., Foerster, A., Kunde, W., & Pfister, R.
Würzburg University

Presenting author: Robert Wirth

Most of our daily life is organized around rules that tell us what to do. By now, numerous studies show that humans have a tendency to abide by the rules, and that breaking them comes with cognitive costs. i.e., a marked behavioral influence of the original rule during rule violations. However, rules also specify what not to do. In the current experiments, we tested how negatively formulated rules affect behavior. Participants conducted finger movements via the touchscreen of an iPad to either follow or break a given rule, and we analyzed temporal and spatial parameters of the ensuing movement trajectories. We found that negatively formulated rules promoted the choice to violate, and violating these rules comes with a benefit rather than behavioral costs. As it turns out, it is not generally more difficult to violate rules, but this difficulty depends on how the to-be broken rule is formulated.

OS1.IBI.6 ON EVALUATING CREATIVE IDEAS: EVIDENCE FROM NEURAL OSCILLATIONS

Rataj, K.
Adam Mickiewicz University, Poznań, Poland
Presenting author: Karolina Rataj

Electrophysiological research on creativity has revealed increases in alpha power when participants generate original responses. However, it remains difficult to dissect creative thinking into specific cognitive processes for several

methodological reasons. At the same time, few studies so far have examined the oscillatory activity linked to evaluating creative items. In the study presented here, the electroencephalographic (EEG) signals were recorded while participants read and evaluated novel metaphoric, literal, and anomalous sentences. The time-frequency analysis showed that novel metaphors were associated with more activity in the theta band as compared to literal sentences. Additionally, the event-related brain potential analysis revealed that creative items (novel metaphoric sentences) elicited larger N400 amplitudes than non-creative items (literal sentences). The results will be discussed in reference to other EEG studies investigating the relationship between oscillatory activity and creativity, as well as cognitive processes underlying creative idea evaluation.

OS1.IBI.7 DOES A SCENARIO INTERVENTION AFFECT THE PROCESSING OF SYLLOGISMS?

Van der Lubbe, R.H.J.^{1,2}, Hofman, E.¹, Siebelink, R.¹, & Kammeier, H.¹

1 University of Twente, The Netherlands; 2 Adam Mickiewicz University, Poland

Presenting author: Rob Van der Lubbe

A scenario intervention can be described as a method that induces the generation of creative ideas that may lead to innovative changes. In the current study, we examined whether this intervention affects the strategy and effectiveness of evaluating the validity of conclusions based on four premises (i.e., syllogisms). Twenty-one participants evaluated conclusions in two blocks separated by either a scenario or a control intervention. The electroencephalogram (EEG) was measured to examine online processing changes. Analyses of the EEG revealed a change in processing over parietal areas, specifically for the scenario intervention. Individual differences in the accuracy of evaluating the conclusions were very large and consistent across the two blocks. However, performance measures revealed no support for a major influence of the scenario intervention. The current EEG findings suggest that a scenario intervention may lead to processing changes, while this may not yet be reflected in behavioral effects.

OS1.IBI.8 INSIGHT IN THE AGE OF DEEP LEARNING: DO SIMULATED CHIMPANZEES DREAM OF ELECTRIC BANANAS?

Colin, T.R.¹ & Belpaeme, T.²

Presenting author: Thomas Colin

We describe a simulation experiment inspired by the animal experiments of Kohler and Epstein, giving special

attention to methodological considerations. Simulation studies of psychological experiments must remain close to the original, while compensating for the weaknesses of AI compared to biological intelligence or for aspects of the experiment that are difficult to model with precision (e.g. the life experience of the subjects). These compensations can result in involuntarily hiding the blindspots of contemporary artificial intelligence in comparison with biological intelligence. These blindspots include, in the context of

insight, structured actions (decisions in large state spaces), motivated prediction (prediction focusing on relevant features), and the combination of adaptability and stability in the face of radical change. Taking into consideration the methodology and results, we suggest that hierarchical reinforcement learning methods based on the performance gradient do not capture aspects of temporally abstract behavior that are essential for insight in problem-solving.

ABSTRACTS
ORAL SESSION 2

Thursday 26th

17:40-20:00

Auditorio

Working Memory

OS2.AUD.1 OFFLOADING WORKING MEMORY IMPROVES PERFORMANCE BUT IMPAIRS LONG-TERM MEMORY

Grinschgl, S.¹, Papenmeier, F.¹, & Meyerhoff, H.S.²

1 University of Tuebingen, Germany; 2 Knowledge Media Research Center Tuebingen, Germany

Presenting author: Sandra Grinschgl

Modern technology such as tablets allow for temporarily externalizing working memory processes (i.e. cognitive offloading). Whereas such externalizations support immediate performance on different tasks, little is known about the long-term consequences of offloading behavior. In the current set of experiments, we demonstrate a trade-off between immediate task performance and the accuracy of subsequent long-term memory. Our participants solved a pattern copy task while we manipulated the costs of cognitive offloading as well as the awareness of a subsequent memory test. Experiment 1 (n=172) shows that increasing costs for offloading result in less offloading behavior but more accurate performance in an unexpected memory test. Experiment 2 (n=172) shows that offloading behavior remained detrimental for subsequent memory performance when participants are aware of the upcoming memory test. This trade-off urges for care when using offloading devices and emphasizes the importance of meta-cognitive evaluations for strategy selection in situations of knowledge acquisition.

OS2.AUD.2 IS THERE PROACTIVE INTERFERENCE FROM EPISODIC LONG-TERM MEMORY TO WORKING MEMORY?

Mizrak, E., & Oberauer, K.

University of Zurich

Presenting author: Eda Mizrak

Proactive interference (PI) from earlier learned information to remembering of more recently learned information is a well-documented finding for episodic long-term memory (eLTM), however, it is unclear whether working memory (WM) is also prone to PI eLTM. Across three experiments, we measured serial recall performance to three types of short lists; a) whose items were repeated in the same order (Hebb), b) whose items were randomized

at each trial and shared the same items with the repeated list (Interference) c) whose items were randomized and did not overlap with the other lists (Control). We hypothesized that Hebb list will be learned and stored in eLTM over time ("Hebb Effect"). We tested whether learned Hebb lists interfered with remembering of same items in different positions from Interference lists. For all the experiments we found no difference between Interference and Control list performance suggesting there was no PI from eLTM to WM.

OS2.AUD.3 EFFECTS OF ATTENTIONAL REFRESHING AND ASSOCIATIVE RELATEDNESS ON RECOLLECTIVE AND NON-RECOLLECTIVE RECALL

Rosselet-Jordan, F.L.^{1,2}, Abadie, M.², Mariz Elsig, S.¹, & Camos, V.¹

1 University of Fribourg, Switzerland; 2 Aix-Marseille University, France

Presenting author: Fiona Laura Rosselet-Jordan

This study aimed at investigating the nature of the processes involved in short-term recall as a function of the availability of attentional refreshing, a working memory (WM) maintenance mechanism, and of long-term memory (LTM) knowledge. In a complex span paradigm, the availability of attentional refreshing to maintain memoranda was manipulated by varying the attentional demand of the concurrent task. Lists of 6 associatively related vs. unrelated words were presented to examine the implication of LTM knowledge. Each trial was presented three times in a row to apply a two-stage model (Brainerd, Reyna, & Howe, 2009) that distinguishes recollective (direct-access) and non-recollective (reconstruction) retrieval. Results showed that both recall and recollection were greater when refreshing was available and when related words were used as memoranda. This suggests that recollection underpinned short-term recall.

OS2.AUD.4 DECODING SENSORY AND ABSTRACT INFORMATION FROM ACTIVITY SILENT BRAIN STATES

Kandemir, G., Karabay, A., & Akyürek, E.G.

University of Groningen (RUG), the Netherlands

Presenting author: Güven Kandemir

Distributed Working Memory (WM) models attribute different levels of WM representations to different regions of the brain. One highly debated factor is whether the information represented in different levels is retained via similar mechanisms. Recently it was shown that sensory information was maintained in activity-silent form and that the state of the network could be revealed following a perturbation by the presentation of a non-informative signal (impulse signal). We applied the same perturbation technique to representations in visual WM, which either corresponded to directly presented orientation gratings, or to stimuli that were recoded following abstract task rules that consisted of rotation instructions. The decoding of EEG recordings revealed that abstract task rules were also retained in activity-silent form and that the impulse signal boosted decoding accuracy during the activity-silent WM maintenance phase. Furthermore, the imagined orientations that were the product of the rotation task were also decodable from impulse-driven activity.

OS2.AUD.5 ROLE OF PHONOLOGICAL WORKING MEMORY IN INITIAL TASK-SET ACQUISITION: A RAPID INSTRUCTED TASK LEARNING STUDY.

Monsell, S. & Graham, B.

University of Exeter, UK

Presenting author: S. Monsell

How quickly are instructions for a task translated into an effective task set? If declarative working memory (DWM) is used to maintain the task S-R rules as initial practice compiles the rules into procedural memory, variables known to affect DWM retention and retrieval should influence task performance while it is still dependent on DWM. Participants were trained on a series of 6-choice RT tasks, with a 1:1 mapping from object pictures to keys. For each task, an instruction phase was followed by test trials. A manipulation of phonological similarity of the objects' names had an effect on performance only over the first few encounters with a stimulus. Even when the instruction phase was changed so that participants had to learn the S-R mappings by trial and error, the effect of similarity was short-lived. An effective task-set is rapidly "compiled" through instruction and early feedback; verbal DWM plays little role thereafter.

OS2.AUD.6 HOW TO MAKE THE PHONOLOGICAL SIMILARITY EFFECT DISAPPEAR?

Barrouillet, P.¹, Camos, V.², & Gorin, S.¹

Presenting author: Pierre Barrouillet

The TBRS model assumes that there are two distinct stores in verbal WM, a phonological loop based on verbal rehearsal and an executive loop based on attentional refreshing. We recently tested this hypothesis in a letter span task requiring participants to perform a cumulative overt rehearsal of the first letters (from 3 to 5) only, and to keep repeating them until the end of the list to block the access of the following letters to the phonological loop. This procedure, called maxispan, results in a dramatic increase in spans. Here we tested the hypothesis that the maxispan procedure strongly reduces the phonological similarity effect. Results showed that this effect was strong with a standard immediate serial recall procedure, but vanished with the maxispan procedure. We will argue that the phonological similarity effect results from an attempt by participants to articulatorily rehearse too many letters, thus misusing their verbal

OS2.AUD.7 MASKING EFFECTS ON CONSOLIDATING ICONIC REPRESENTATIONS AND ON THE DEPLOYMENT OF ATTENTION RETROSPECTIVELY.

Shimi, A.

University of Cyprus

Presenting author: Andria Shimi

Visual short-term memory (VSTM) improves developmentally but what drives this improvement is not well understood. Recent findings have shown that although differences in the ability to use attention to enhance maintenance are important for understanding improvements, changes in this ability are not the end-point to understanding developmental differences in VSTM performance (Shimi & Scerif, 2017). I will present data from a new experiment aiming to examine whether masking previously-presented information interferes with the consolidation of iconic representations and if so, differentially over development. Seven-year-olds and adults were asked to report whether a probe had been part of the initial memory array, which could be uncued or followed by a spatial cue directing participants' attention to a location in the array. The presentation of backward masking stimuli was also manipulated to evaluate whether masking slowed consolidation and modulated cueing benefits. Results extend knowledge on constraining mechanisms influencing attentional deployment and VSTM.

Cibeles Room

Cognitive Control

OS2.CIB.1 EFFECTS OF COMPLEXITY AND PROCESSING CODE OF AN INTERRUPTION TASK ON THE PERFORMANCE IN A PROCEDURAL TASK WITH SEQUENTIAL CONSTRAINTS
Radovic, T. & Manzey, D.

Technische Universität Berlin, Germany

Presenting author: Tara Radovic

The study examines effects of complexity and processing code of an interruption task on the post-interruption performance in a primary task. The primary task (PT) is a procedural task with sequential constraints consisting of eight steps, each requiring a binary decision about a certain property of a complex visual stimulus. While performing the PT, participants are interrupted for 30s at different steps by an interruption task varying in complexity (2-back; 1-back task) and processing code (spatial; verbal). After interruption, participants have to resume the PT at the correct step. Assuming that interruptions demanding more of the same cognitive resources as the PT are more disruptive, we expect the strongest interruption effects for the verbal 2-back interruption, and the weakest for the spatial 1-back task, in terms of resumption times (how fast the PT is resumed) and sequence errors (how often the PT is resumed at the wrong step).

OS2.CIB.2 THE DEVELOPMENT OF THE PROCESSING COST ENTAILED BY CONFLICTING AFFORDANCES DURING OBJECT PERCEPTION

Godard, M.¹, Wamain, Y.¹, Delepoulle, S.², & Kalénine, S.¹
1 University of Lille, France; 2 University of Littoral Côte d'Opale, France.

Presenting author: Marc Godard

The perception of manipulable objects involves the activation of motor information in the absence of real action (i.e. affordance perception). Recent findings indicate that perceiving an object evoking distinct grasp-to-move and grasp-to-use gestures induces a processing cost. The present study aims to assess the development of this conflict cost. As it is assumed to result from the combination of general affordance sensitivity and conflict monitoring abilities, the conflict cost should follow a non-linear development. Ninety-four participants (from 8 to adulthood)

performed 3D object perception tasks, an action priming task and a Simon task to assess the conflict cost induced by the evocation of distinct affordances, affordance sensitivity and conflict monitoring, respectively. Results showed that the conflict cost follows a non-linear development and evolves jointly with general affordance sensitivity. The contribution of conflict monitoring abilities requires further investigations. Findings highlight novel refinements in the development of perception-action interactions.

OS2.CIB.3 DISSOCIATION BETWEEN REACTION TIME AND PUPIL DILATION IN THE COLOR-WORD STROOP TASK.

Hershman, R. & Henik, A.

Ben-Gurion University of the Negev, Israel

Presenting author: Ronen Hershman

It has been suggested that the Stroop task gives rise to two conflicts: the information conflict (color vs. word meaning) and the task conflict (name the color vs. read the word). However, behavioral indications for task conflict (RT congruent condition longer than RT neutral condition) appear under very restricted conditions. We conducted Stroop experiments and measured RT and pupil dilation. The results show a clear dissociation between RT and pupil dilation. We found the regular RT pattern—large interference and small, non-significant facilitation. In contrast, pupil dilation showed information conflict—larger pupil dilation to incongruent than to congruent and neutral conditions—and task conflict—larger pupil dilation to the congruent than to the neutral condition. Moreover, pupil indications for task conflict appeared earlier than indications for the information conflict. These results suggest that pupil changes could indicate conflict even in the absence of behavioral indications for the conflict.

OS2.CIB.4 COGNITIVE CONTROL DEFICITS RELATED TO ANOSOGNOSIA AFTER ACQUIRED BRAIN INJURY IN EXPERIMENTAL AND DAILY LIFE TASKS

Ricchetti, G.^{1,2}, Navarro-Egido, A.^{1,2}, Merchán-Baeza, J.A.³, Salazar Frías, D.^{1,2}, Rodríguez Bailón, M.⁴, & Funes, M.J.^{1,2}

1 University of Granada, Spain; 2 Mind, Brain and Behavior Research Center (CIMCYC), Spain; 3 University of Vic-Central University of Catalonia, Spain; 4 University of Málaga, Spain.

Presenting author: Giorgia Ricchetti

Acquired brain injury (ABI) patients are often unaware of their own cognitive deficits, a phenomenon called anosognosia. Inhibitory control (i.e. conflict resolution), monitoring (i.e. error detection) and self-regulation (i.e. error correction) have been associated to this syndrome, however they have been typically measured using experimental tasks unrelated to everyday life. In this study we compared inhibitory control, monitoring and self-regulation abilities of a group of ABI patients with anosognosia and a control healthy group through an experimental conflict based task (ET) and an activity of daily living (ADL) task including conflicting situations. Results revealed that patients showed more difficulty to inhibit action towards conflicting stimuli on the ET and the ADL task compared to controls, and detected fewer errors during ADL performance. No differences were found in self-regulation between groups in neither of the two tasks. We conclude that inhibitory control and monitoring impairments could be major mechanisms underlying anosognosia.

OS2.CIB.5 WHEN CONFLICT BRINGS PLEASURE: EXAMINING THE NECESSARY CONDITIONS UNDER WHICH INCONGRUENT STIMULI ARE EVALUATED AS POSITIVE

Ivanchei, I.I.¹, Braem, S.², Vermeylen, L.¹, & Notebaert, W.¹

1 Ghent University, Belgium; 2 Vrije Universiteit Brussel (VUB), Belgium

Presenting author: Ivan Ivanchei

Recent studies have demonstrated that cognitive conflicts, as experienced during incongruent Stroop-stimuli ("GREEN" printed in red), are automatically evaluated as negative, in line with theories emphasizing the aversive nature of conflict. However, correct responding to such stimuli has been shown to trigger a positive evaluation, presumably reflecting the positive surprise people feel when overcoming conflict. Using an affective priming paradigm, the present study investigated whether stimulus frequency (i.e., number of unique stimulus presentations) and task experience (i.e., number of trials) play an important role in this positive evaluation. Importantly, we observed that responding to incongruent stimuli was evaluated as negative on the first trials, but as positive later in the experiment (in

an experiment that controlled for stimulus frequency). These results fit with the idea that we first need to create outcome expectancies (lower expectancies for being correct on incongruent trials) before we experience the resolution of conflict as positive.

OS2.CIB.6 THE ROLE OF THETA OSCILLATIONS IN COGNITIVE CONTROL: STIMULUS-RESPONSE BINDING IN BEHAVIOR AND ELECTROENCEPHALOGRAPHY

Senoussi, M., Verbeke, P., De Loof, E., Talsma, D., & Verguts, T.

Ghent University, Belgium

Presenting author: Mehdi Senoussi

Cognitive control is the ability to guide thoughts and actions towards goals. It allows us to flexibly implement complex behavior depending on context. One of its features is the implementation of stimulus-response mappings (SRM) by binding goal-relevant perceptual representations and actions. A recent computational model of cognitive control implements a mechanism to bind arbitrary task-relevant (neural) representations, through synchronization, by bursts sent at theta frequency (4-8Hz). In a series of behavioral and electroencephalography experiments we tested predictions from this model in SRM tasks. By interrogating the temporal dynamics of cognitive control through varying delays between SRM instructions and stimuli we show that performance is modulated periodically in the theta frequency band (5Hz). Furthermore, neural representations of instructed SRM followed these theta oscillations, validating the neural predictions from the model. Together, these results provide support to this model and new insights on the mechanisms underlying cognitive control.

OS2.CIB.7 THE CAUSAL ROLE OF THE LEFT DORSOLATERAL PREFRONTAL CORTEX IN THE INHIBITORY TAGGING EFFECT: EVIDENCE FROM HIGH DEFINITION TRANSCRANIAL DIRECT CURRENT STIMULATION

Martínez-Pérez, V.¹, Castillo, A.¹, Sánchez-Pérez, N.², Vivas, A.B.³, Campoy, G.¹, & Fuentes, L.J.¹

Presenting author: Luis J. Fuentes

When an inhibition of return procedure is combined with conflict tasks (e.g., Stroop task), both inhibition of return (IOR) and inhibitory tagging (IT) effects are usually observed. At the cortical level, IOR involves the dorsal frontoparietal network, whereas IT involves the executive prefrontal cortex, mainly the DLPFC. Behaviorally, IOR is observed with rather long cue-target intervals in

discriminative tasks, whereas IT has been observed when the prime-target interval is just 250 ms. Here, we asked whether IT is also applied to ongoing emotional processing, and whether the left DLPFC plays a causal role in IT. By using transcranial direct current stimulation (tDCS), we observed reduced conflict effect, the signature of IT, when the prime word was presented at the cued location and the prime-target interval was 250 ms, neither earlier nor later. In a second experiment, the IT effect was eliminated when cathodal stimulation was applied to the left DLPFC.

Estambul Room

Neural Plasticity

OS2.EST.1 CATEGORICAL REPRESENTATION FROM SOUND AND SIGHT IN THE OCCIPITO-TEMPORAL CORTEX OF SIGHTED AND BLIND

Mattioni, S.¹, Rezk, M.¹, Cuculiza Mendoza, K.E.², Battal, C.1, Bottini, R.², van Ackeren, M.J.², Oosterhof, N.N.², & Collignon, O.^{1,2}

1 Université Catholique de Louvain (UCLouvain), Belgium; 2 University of Trento, Italy

Presenting author: Stefania Mattioni

The Ventral Occipito-Temporal Cortex (VOTC) shows robust category selective response to visual information. How is this functional organization tributary of visual input or even visual experience? To address these questions, we used fMRI to characterize the brain responses to eight categories (4 living, 4 non-living) presented acoustically in sighted and early blind individuals, and visually in a separate sighted group. Using a combination of decoding and representational similarity analyses, we observed that VOTC reliably encodes sounds categories in the sighted and blind groups using a structure strikingly similar to the one found in vision. Blind people however showed higher decoding of auditory categories in VOTC. In addition, the correlation between the representational structure of visual and auditory categories was almost double in the blind ($r=.66$) when compared to the sighted ($r=.35$) group. Crucially, we also show that VOTC represents the semantic but not the acoustic relations between auditory categories in both groups. Our results suggest that early visual deprivation triggers an extension of the intrinsic categorical organization of VOTC that is partially independent from vision.

OS2.EST.2 THE VISUAL PERCEPTION OF SOUNDS: INVESTIGATING FUNCTIONAL PLASTICITY WITH VISUO-AUDITORY SENSORY SUBSTITUTION

Auvray, M.¹, Pesnot-Lerousseau, J.², & Arnold, G.¹

1 CNRS, Paris, France 2 University of Marseille, France

Presenting author: Malika Auvray

How plastic is the brain when it comes to the distinction between our sensory modalities? The aim of our study was to investigate behaviourally this question via a non-invasive technique named "sensory substitution". People were

trained to use a visual-to-auditory conversion device, which translates visual images into sounds. Taking advantage of a Stroop-like paradigm, our study revealed that, after training, when asked to identify sounds, participants would spontaneously have visual images, as their performance in sound identification was influenced by the simultaneous presentation of visual distractors. This visual interference effect shows that visual imagery became associated to auditory stimuli. In addition, participants' performance during training for localisation and recognition tasks, as well as their associated phenomenology, depended on their auditory abilities, revealing that processing finds its roots in the input sensory modality. Altogether, our results show that brain plasticity allows people to see sounds while still hearing it.

OS2.EST.3 METAPLASTICITY PROTOCOL IN COGNITIVE TRAINING WITH TDCS

Vranić, A., & Martinčević, M.

University of Zagreb, Croatia

Presenting author: Andrea Vranić

Transcranial direct current stimulation (tDCS) is a relatively new addition to cognitive enhancement procedures, yielding various outcomes. Recently, metaplasticity protocol has been proposed to heighten the training effects. Metaplasticity refers to activity-dependent changes in neural functions that modulate subsequent synaptic plasticity. The aim of this study was to verify the effectiveness of a combination of tDCS and cognitive training within metaplasticity research design. Thirty one healthy young adults were randomly assigned to either treatment or active control (sham) group. The design included an 8-session training in which equal protocol, differing only in tDCS/sham stimulation, was used for both group (n-back + 5min pause + (n-back+tDCS/sham)), with pretest, posttest and follow-up at 5 months. Repeated measures ANOVA did not find statistically significant interactions between groups and measurement points for the n-back tasks, forward and backward span, symmetry span, oddball and the bivalent shape task.

OS2.EST.4 THE TIME COURSE OF BRAIN REORGANIZATION IN HEARING LATE LEARNERS OF SIGN LANGUAGE

Banaszkiewicz, A.¹, Matuszewski, J.¹, Bola, Ł.^{1,2,3}, Szczepanik, M.¹, Rutkowski, P.⁴, Szwed, M.², Emmorey, K.⁵, Jednoróg, K.¹, & Marchewka, A.¹

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Presenting author: Anna Banaszkiewicz

The neural plasticity underlying learning is a process rather than a single event, however the dynamics of training-induced functional reorganization are rarely examined. Here, we focus on sign language acquisition in hearing adults who underwent an 8-month long training with five neuroimaging sessions. At each session, we tested whether growing proficiency leads to increased brain activity to sign language and a brain-wide reconfiguration of activity patterns due to the transition from sensory to linguistic processing. Language network reorganization occurred after 3 months of learning (second fMRI session), as reflected by increased activation in modality-independent perisylvian language-related network, together with modality-dependent parieto-occipital, visuospatial and motion-sensitive regions. Despite further progress, no significant alterations in fMRI response were detected during the following months. This indicates that large-scale brain reorganization occurs during the first months of sign language acquisition, and further consolidation and learning proceeds in a stable, local manner.

OS2.EST.5 FUNCTIONAL AND STRUCTURAL BRAIN PLASTICITY DURING TACTILE READING ACQUISITION IN SIGHTED ADULTS: MULTIMODAL MRI APPROACH

Matuszewski, J.¹, Bola, Ł.^{1,2,3}, Kossowski, B.¹, Banaszkiewicz, A.¹, Paplińska, M.⁴, Szwed, M.², Jednoróg, K.¹, Draganski, B.⁵, & Marchewka, A.¹

1 Polish Academy of Sciences, Poland; 2 Jagiellonian University, Poland; 3 Harvard University, USA; 4 Academy of Special Education, Poland; 5 University of Lausanne, Switzerland

Presenting author: Jacek Matuszewski

Neuroimaging studies showed that adult brain can undergo functional and structural plasticity. However, detailed temporal dynamics of that reorganization are still poorly understood. Tactile Braille reading acquisition is an interesting model, as it induces cross-modal plasticity – reorganization in visual cortex followed by somatosensory training. Here, we studied interactions between brain activity, grey matter volume (GMV) and myelination in 26 sighted students participating in 8-months tactile reading

course with 4 multimodal MRI sessions during training and follow-up study after 2.5-months break. We observed functional plasticity in the first stage of learning both in sensory and language processing areas. These changes were followed by linear increases in GMV of somatosensory and visual cortex observed also in follow-up study. Additionally, myelination increase was observed in visual word form area and right frontal lobe. These results show that tracing various aspects of plasticity simultaneously during training offers a unique insight into experience-driven neural changes.

OS2.EST.6 PROBING PSYCHOPHYSICALLY THE CORTICAL PLASTICITY HYPOTHESIS IN MACULAR DEGENERATION

Casco, C. & Contemori, G.

University of Padova, Padova, Italy

Presenting author: Clara Casco

Macular degeneration patients (MD) develop a preferred retinal locus for fixation (PRL). The use of PRL might produce cortical plasticity with respect to a symmetrical position (non-PRL) and to an iso-eccentric region in controls: we asked whether high contrast flankers modulate contrast gain for the target more when flankers are collinear rather than orthogonal. Results revealed in both PRL and non-PRL, at the shortest target-to-flankers distance (2λ), facilitation rather than inhibition as it happens in controls and that this effect depends on the individual contrast sensitivity at the baseline. When the target-to-flankers contrast ratio increases the inhibition decreases, then switching to facilitation. However, when ratio surpasses 1 the facilitatory effect progressively reduces and then disappears. This relationship is expressed by a 'dipper' function (Zenger and Sagi, 1996) for normal vision, indicating neither a phenomenon of spontaneous nor use-dependent cortical plasticity, but rather perceptual grouping within high-level receptive field.

OS2.EST.7 PLASTICITY IN THE AUDITORY CORTEX OF THE DEAF: RETAINING TASK-SPECIFIC PURPOSES OR PLURIPOTENTIAL ACQUISITION OF A NEW ATTENTIONAL AREA?

Zimmermann, M.¹, Bola, Ł.², Rutkowski, P.³, Jednoróg, K.⁴, Marchewka, A.⁴, & Szwed, M.¹

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Presenting author: Maria Zimmermann

Previous studies (e.g. Bola et al., PNAS 2017) suggest that the deafs' auditory cortex preserves its task-specific function (i.e. rhythm processing) despite switching to a

different sensory modality (visual). An alternative possibility is, however, that visual activations in auditory cortex indicate that it acquires, in fact, a new cognitive function - attention. To distinguish between these two hypotheses, we performed a pilot fMRI study on three congenitally deaf participants, with four different visual tasks: a luminance discrimination task with or without temporal content, faces/houses recognition task, spatial pattern (checkerboard) image discrimination task, and temporal/spatial sequences comparison. We found that only spatial pattern recognition, which had a very low attentional load, did not activate the auditory cortex. All three remaining tasks activated very similar auditory areas (right posterior STG). Our pilot suggests that the auditory cortex in the deaf may not retain its task-specific function but become a secondary attentional area.

Atenas Room

Bilingualism

OS2.ATE.1 COGNITIVE PROCESSING OF UNADAPTED ENGLISH WORDS IN CROATIAN: EVIDENCE FROM CROATIAN SPEAKERS OF ENGLISH WITH DIFFERENT LEVELS OF L2 PROFICIENCY

Bogunović, I.¹ & Ćoso, B.²

1 University of Rijeka, Croatia; 2 University of Rijeka, Croatia

Presenting author: Irena Bogunović

This study aims to investigate priming effect in L2 speakers with different levels of language proficiency. The study consisted of a questionnaire on language use, a proficiency test, and three priming experiments. Experiment 1 explored priming effect in both language directions and two conditions (associative and semantic relatedness; translation equivalence). The other two experiments focused on different language directions with unadapted English words. The results showed that reaction times were shorter when primes and targets were related. In Experiment 1, the participants responded faster in L1-L2 direction. The effect of proficiency was observed in Experiments 2 and 3. These findings imply that L2 speakers have direct access to conceptual representations of L2 words, regardless of their proficiency level. The speed with which L2 words are accessed is related to vocabulary knowledge and subjective word frequencies, suggesting that frequency of use, rather than language membership, affects bilingual lexical access, even in low-proficiency L2 speakers.

OS2.ATE.2 VOCABULARY ACQUISITION IN A FOREIGN LANGUAGE: ELECTROPHYSIOLOGICAL EVIDENCE OF THE ADVANTAGE ASSOCIATED WITH SEMANTIC VS. LEXICAL LEARNING

García-Gómez, A.B. & Macizo, P.

University of Granada

Presenting author: Pedro Macizo

In our study, we obtained electrophysiological markers associated with the acquisition of vocabulary in a second language (L2) by comparing a semantic and a lexical training method. The semantic training involved a picture-word paradigm and a semantic categorization task while the lexical training included a word-word method and a

grapheme monitoring task. After learning, brain electrical activity was recorded in a forward and backward translation task and a naming task in L1 and L2. The electrophysiological measures obtained in the semantic vs. lexical training revealed: (a) early semantic and lexical access in the L2 naming task and (b) early semantic access in the forward translation task. The pattern of results suggests that a single session of semantic vs. lexical learning favors the establishment of connections between semantics and the words learned in L2.

OS2.ATE.3 ERP STUDY ON THE BILINGUAL ADVANTAGE IN WITHIN-LANGUAGE CONFLICT RESOLUTION

Ramos, M.A.¹ & Macizo, P.²

1 University of Barcelona (UB), Spain; 2 University of Granada (UGR), Spain

Presenting author: María Ángeles Ramos Moreno

The bilingual advantage in cognitive control is one of the most questionable topics in the current scientific research. In this study, we compared Spanish (L1) - English (L2) bilinguals and Spanish monolinguals in a semantic judgement relationship task in L1 that produced within-language conflict due to the coactivation of the two meanings of a homophone (e.g., “callado” and “cayado”, meaning “silent” and “crook” in English). In this task, participants indicated if pairs of words were related or not (“ruidoso-cayado” i.e., “noisy-crook”). Conflict arose because a word (“ruidoso”) not related to the orthographic form of a homophone (“cayado”) was related to the alternative orthographic form (“callado”). Compared to a control condition with unrelated word pairs (“película-cayado”; “movie-crook”), the results found greater behavioral interference and N400 modulations in monolinguals compared to bilinguals which suggest better conflict resolution in bilinguals.

OS2.ATE.4 CROSS-LINGUISTIC GENDER INTERFERENCE IN L2 LEARNERS: THE EFFECT OF COGNATE STATUS AND GENDER CONGRUENCY

von Grebmer zu Wolfsturn, S., Pablos-Robles, L., & Schiller, N.O.

Leiden University

Presenting author: Sarah von Grebmer zu Wolfsturn

This study systematically explores cross-linguistic interference effects on L2 processing of gender in German-Spanish L2 learners and the role of cognate status and gender congruency. To this date, no study has directly examined whether both cognate status and gender congruency regulate gender interference effects, and what the implications are for L2 gender attainment. We combined EEG techniques to trace the temporal unfolding of interference, with a syntactic violation paradigm and a picture-naming task to track the effects of interference. We modelled ERP amplitudes (P600 indexing syntactic violations and N200 indexing L1 inhibition) and processing latencies while manipulating the cognate status of nouns and gender-congruency across L1 and L2. We hypothesised stronger interference effects as a result of interaction between cognate status and gender-congruency, reflected in shorter processing times for cognates as well as gender-congruent nouns. These results are highly relevant for characterising L2 gender processing and acquisition mechanisms.

OS2.ATE.5 CROSS LINGUISTIC INFLUENCES IN L3 SYNTACTIC PROCESSING

Prior, A., Abbas, N., & Degani, T.

University of Haifa, Israel

Presenting author: Anat Prior

Learners acquiring the syntax of a third language (L3) might be influenced by existing knowledge from their first (L1) and/or second (L2) languages. Indeed, models of L3 acquisition differ in identifying the source of cross-linguistic influence, and various transfer patterns have been reported. The current study investigates Arabic-Hebrew-English university student trilinguals, who are not self-selected and for whom both L1 and L2 are typologically distant from the target L3, English, allowing us to overcome confounds of previous research. Participants read English sentences that overlapped syntactically with one, both or neither of their previous languages, while their eye movements were recorded and then performed grammaticality judgments on each sentence. Online reading times and off-line performance are analyzed in order to address the central question of whether L1 or L2 can be identified as a dominant source of cross-linguistic influence, or whether the entire linguistic repertoire is activated when processing L3.

OS2.ATE.6 PROFICIENCY SHAPES THE REPRESENTATION AND ACCESS OF SYLLABIC MOTOR PROGRAMS IN BILINGUAL SPEAKERS: SYLLABLE-FREQUENCY EFFECTS IN EARLY HIGH-PROFICIENT SPANISH-BASQUE BILINGUALS AND LATE LOW-PROFICIENT SPANISH-GERMAN BILINGUALS

Cholin, J.¹, Abad Bruzzo, K.F.¹, Jorschick, A.B.¹, & Carreiras, M.²

1 Bielefeld University, Germany; 2 Basque Center on Cognition, Brain and Language (BCBL), Spain

Presenting author: Joana Cholin

Speakers' ability to speak fluently might rely on stored motor-programs for high-frequency syllables. A slower segment-by-segment assembly may be used to construct novel or low-frequency syllables. Previous studies show that monolingual speakers produce high-frequency syllables faster than low-frequency syllables. For bilingual speakers, results are scarce but point towards independent language-specific syllabic representations for early high-proficient bilinguals, while late low-proficient bilinguals seem to rely on language-shared representations. Testing the hypothesis that syllabic motor representations change with proficiency, we first replicated syllable-frequency effects in German and Spanish monolingual speakers using highly controlled materials. We then tested early high-proficient Spanish-Basque bilinguals and late low-proficient Spanish-German bilinguals with the Spanish and German materials respectively. RTs depended on whether the target syllable had one, no or several possible correspondences in the complementary language. Results show qualitative differences between proficiency groups supporting our hypothesis and further elucidating underlying motor-learning processes in bilingual speakers.

OS2.ATE.7 LANGUAGES NEVER REST! IN THE BILINGUAL BRAIN ALL LANGUAGES ARE AUTOMATICALLY ACTIVATED WHEN NONE IS USED

Aristei, S.¹, Lochy, A.¹, Rossion, B.², & Schiltz, C.¹

1 University of Luxembourg, Luxembourg; 2 Universit  de Lorraine, France

Presenting author: Sabrina Aristei

The established automaticity of word recognition has recently been challenged. To test automaticity in bilinguals, we analyzed the amplitude of brain responses synchronized with the repeated presentation of German and French words appearing in streams of non- and pseudowords at 10Hz. Participants were unaware of stimulus lexicality. A typical left posterior brain response to words emerged and was modulated by the wordlikeness of non-lexical strings (i.e. smallest within pseudowords).

Furthermore, responses to words from the weaker language L2 were maximally reduced within pseudowords of the dominant language L1, both in late learners and balanced bilinguals. In a group of monolinguals, there was no brain response to words or modulation from pseudowords in the unknown language. Hence, when no language is explicitly activated, lexical access occurs automatically for all languages, with the degree of activation reflecting the language strength. Our data support a unique lexicon for all languages in the brain.

St Tropez Room

Language Development

OS2.StT.1 THE ROLE OF ATTENTION AND INHIBITION IN LINGUAL PERFORMANCE IN THE CONTEXT OF A LOGOGRAPHIC AND ALPHABETIC WRITING SYSTEM

Guo, C., Tseaye, A. & Logemann, H.N.A.

Eötvös Loránd University, Hungary

Presenting author: Cuiling Guo

Visual attention facilitates the processing of visual stimuli, while inhibition suppresses the processing of irrelevant visual information. They often work together in a synergy sense to better interpret incoming visual objects, e.g. an English word. Deficits of attention and inhibition have been implicated in reading performance, supported from the evidence that ADHD has been associated with poor reading performance across different languages. However, to the best of our knowledge, it is not clear what the relative contribution of the aforementioned executive systems to lingual performance is, and whether this relation differs across writing systems. The primary aim of the current study is to address this ambiguity. Previous studies have suggested that there may be a complex relation between weight and executive performance. Hence, a secondary explorative aim of the current project, is to explore the role of Body Mass (BMI) in executive performance.

OS2.StT.2 CONTRIBUTIONS OF FPVS APPROACH TO UNDERSTANDING OF READING ACQUISITION MECHANISMS.

van de Walle de Ghelcke, A.¹, Rossion, B.^{1,2}, Schiltz, C.³, & Lochy, A.³

1 University of Louvain (UCL), Belgium; 2 University of Lorraine (UL), France; 3 University of Luxembourg (UNI.LU), Luxembourg

Presenting author: Alice van de Walle de Ghelcke

Adults' expert reading is a highly automated process supported by the left hemisphere. This left specialization is thought to emerge during children's reading acquisition through progressive connections between posterior visual regions and anterior language regions. However, the exact onset and the development of this specialization remain unclear. To investigate these questions, we adopted a longitudinal and transversal design to assess neural discrimination responses in children of different ages and reading

profiles. Children were tested behaviorally and with electroencephalography using Fast Periodic Visual Stimulation (FPVS-EEG) to measure selective neural responses to letter strings. Our findings highlighted an early emergence of the left neural specialization for reading and a specific modulation of the neural responses to letter strings according to age and reading profile. Taken together, these findings open promising applications of the FPVS-EEG approach in early detection of reading acquisition disorders.

OS2.StT.3 INVESTIGATING THE EFFECTS OF MATURATION AND SES ON EARLY SPEECH PERCEPTION

Gonzalez-Gomez, N.¹, O'Brien, F.², & Harris, M.¹

1 Oxford Brookes University; 2 Oxford University Hospitals, NHS.

Presenting author: Nayeli Gonzalez-Gomez

Three longitudinal studies explored infants' phonetic (i.e., discrimination of a non-native consonantal contrast), prosodic (i.e., discrimination of non-native lexical tones) and phonotactic (i.e., preference for CVC sequences having higher- or lower-frequency of occurrence) development in infants born preterm or full-term and from lower- or higher socio-economic status families. 76 Infants were tested longitudinally at 7.5, 9, 10.5 and 12 months. Results showed no significant differences between the phonetic or the phonotactic development of preterm and full-term infants. However, a time-lag between preterm and full-term developmental timing for prosody was found. Socioeconomic status didn't have a significant effect on prosodic development. Nevertheless, phonetic and phonotactic development were both affected by SES. Infants from lower SES backgrounds showed perceptual phonetic narrowing later, and had a delayed preference for high-frequency sequences later than their more advantaged peers. Overall these results suggest that different constraints apply to the acquisition of different phonological subcomponents.

OS2.StT.4 THE IMPACT OF VISUAL MAGNOCELLULAR FUNCTIONING ON READING SKILLS IN FRENCH PRIMARY SCHOOL CHILDREN

Leclercq, V.¹ & Bellocchi, S.²

University Paul Valéry Montpellier 3

Presenting author: Virginie Leclercq

Many studies have investigated the visual magnocellular system in dyslexia. However, few researches have explored the magnocellular functioning during normal reading (e.g., Kevan & Pammer, 2009; Talcott et al., 2000). Consequently, very little is known on the link between the visual magnocellular system and reading development. Here we aimed to explore whether the link between visual abilities and reading might be affected by reading proficiency. We tested 103 French typical developing readers [51 beginning readers (Grade 1), 52 proficient readers (Grade 5)] with reading tests and a coherent dot motion task measuring the visual magnocellular functioning. Results indicate a positive correlation between visual magnocellular functioning and reading for beginning readers but not for proficient readers. These results suggest that the link between magnocellular functioning and reading abilities depends on the number of years of reading exposure.

OS2.StT.5 THE LINGUISTIC AND SOCIAL SIDES OF PACIFIER USE IN INFANCY

Barca, L.¹ & Borghi, A.M.^{2,1}

1 National Research Council (CNR), Italy; 2 La Sapienza University of Rome, Italy

Presenting author: Laura Barca

Evidence suggests that the Age of Pacifier Withdrawal (APW) affects linguistic processing later in life. Children who used the pacifier for a longer period used more concrete strategies (e.g., functional relations), and less abstract strategies (e.g., free associations) while describe different concepts. Moreover, 8 years old children with APW of 72 months were slower in the semantic categorization of abstract words, with respect to concrete and emotional ones. Here, we will explore the effect of pacifier use on linguistic development of 47 Italian children, aged 18-36 months. Their parents compiled the MacArthur-Bates CDI, a parent report assessing early language acquisition; the Parenting Style Questionnaire, evaluating their own behavior according to three parenting domains (social, didactic, disciplinary); and the Parental Sense of Confidence questionnaire, to assess their sense of satisfaction and parental efficacy. Results will be discussed taking into account social aspects related to pacifier use and linguistic development.

OS2.StT.6 WHAT EYE MOVEMENTS REVEAL ABOUT THE WORD ENCODING PROCESSES OF YOUNGER AND OLDER ADULTS

Taconnat, L., Morel, S., Guerrero-Sastoque, L., Frasca, M., & Vibert, N.

CNRS - Université de Poitiers - Université de Tours, France

Presenting author: Nicolas Vibert

This eye-tracking study compared the way 39 younger and 50 older adults encoded words in anticipation for a memory task. Participants had to learn successively a set of 20 "organizable" words, which belonged to five different semantic categories, and a set of 20 "non-organizable" words, each presented for 100 seconds on a single display. Participants were then asked to recall as many as possible words of each set. The results confirmed the detrimental impact of aging on memory and showed that when they encoded the words, older adults did not look at them as much as younger adults, because of slower eye movements. Younger adults, but not older ones, adapted their scanning strategy to the words they were learning: They made more fixations per word when the words were organizable, which may help group the words by category, but they made longer fixations on non-organizable than on organizable words.

OS2.StT.7 IQ VERSUS EXECUTIVE FUNCTIONS: INVESTIGATING THE PREDICTIVE ROLES OF IQ, WORKING MEMORY AND SUSTAINED ATTENTION IN CHILDREN'S READING ACHIEVEMENT

Slattery, É.J., Ryan, P., Fortune, D.G., & McAvinue, L.P.
University of Limerick, Ireland.

Presenting author: Éadaoin Slattery

It is well established that cognitive abilities are important predictors of achievement and learning in children. The purpose of the present study was to examine the relative contributions of IQ and selected executive functions (working memory and sustained attention) to the prediction of reading achievement (word decoding and reading comprehension). Irish primary school children (N = 104) aged 8-10 years completed measures of each cognitive and reading-related ability. Hierarchical multiple regressions revealed that IQ and executive functions are differentially related to reading achievement. IQ is a better predictor of reading comprehension than of word decoding. Conversely, executive functions matter more for the prediction of word decoding than of reading comprehension. In relation to each executive function, working memory predicts both reading achievement scores, over and above IQ; however, the variance in reading achievement attributable to sustained attention over IQ, is explained by working memory. Theoretical and applied implications are discussed.

Tarraco Room

Sociality

OS2.TAR.1 MICRODOSING PSYCHEDELICS ENHANCES EMOTION RECOGNITION

Colzato, L.S., Maraver, M.J., Prochazkova, L., Rifkin, B.D., & Hommel, B.

Ruhr University Bochum

Presenting author: Lorenza Colzato

Taking small doses ("microdosing") of psychedelic substances such as truffles allegedly has multiple beneficial effects, including emotion recognition, via its primary effects by directly binding to 5-HT_{2A} receptors. The goal of this study was to examine, for the first time, the quantitative longitudinal effects of microdosing psychedelic truffles on the ability to recognize emotions of others, controlling for expectation effects. We carried out the first longitudinal (with participants taking 6 microdoses over the course of 18 days) triple-blind, between-group, placebo-controlled field study employing the Reading the Mind in the Eyes Test (RMET) in 59 young healthy participants. Taking microdoses of psychedelic substances, compared to placebo, improved performance on the RMET. This effect was restricted to the difficult items and was independent from expectation effects. Our data suggest that microdosing psychedelics improves the ability to infer the mental state of others from social cues of the eye region.

OS2.TAR.2 MAPPING THE "SHARED BRAIN"

Hinvest, N.S., Ashwin, C.A., Hook, J., Scarampi, C., Smith, L.G.E., & Stothart, G.

University of Bath, U.K.

Presenting author: Neal Hinvest

The ability to detect the neural processes underlying the formation of a shared identity between interacting individuals would reveal the unconscious psychological framework that underpins social behaviour. In the first phase of our project we used EEG as a tool of classifying individual emotional status, based on the theory that social identity is based on shared emotion. We used a rigorously-defined experimental approach and obtained strikingly different classification rates compared to other researchers. This speaks to the methods and approaches currently used within the field. We provide a critique of methods with the

aim of building new, more rigorous, approaches to EEG-based classifiers of emotion. In the second phase we used a peer-reviewed method of classifying stages in the development of a shared identity via observed behaviour to identify events within EEG of freely interacting dyads to map the unconscious emergence of a shared identity and will present these findings.

OS2.TAR.3 OBSERVATION OF COMMUNICATIVE CUES ASSIGNS MEANING TO HUMAN INTERACTION: AN EEG STUDY

Kourtis, D.¹, Pierre Jacob, P.², Sebanz, N.³, Sperber, D.^{3,2}, & Knoblich, G.³

1 University of Stirling, Stirling, UK; 2 Institute Jean Nicod (CNRS, EHESS, ENS), France; 3 Central European University, Hungary

Presenting author: Dimitrios Kourtis

We investigated whether the observation of communicative cues makes subsequent interaction more meaningful. EEG was recorded while participants observed photo sequences depicting two actors seated next to a table with two nearly identical objects on it. The actors occasionally engaged in mutual eye contact and/or one of them pointed towards an object. Subsequently, the other actor looked either at that object or at the other object. EEG analyses showed that the N300 was smaller when the actors looked at the same object, suggesting that identification of actor-object relationships is a relative fast process. The N400 was smaller when the final scene was preceded by mutual eye contact or by perception of the pointing gesture, regardless of whether the two actors looked at the same object. This suggests that observation of communicative cues "opens up" the mind to different action possibilities, enabling him/her to assign meaning to typically unexpected interaction outcomes.

OS2.TAR.4 YOUR FACE SCARES ME: EFFECTS OF PERCEPTUAL LOAD AND SOCIAL ANXIETY ON PROCESSING OF THREATENING AND NEUTRAL FACES

Theodorou, M.¹, Konstantinou, N.², & Panayiotou, G.¹

1 University of Cyprus; 2 Cyprus University of Technology

Presenting author: Georgia Panayiotou

Faces are biologically significant, believed to be given preferential attention. However, processing of competing stimuli is modulated by perceptual load (Lavie, 1995): A demanding task (high load) absorbs all processing capacity, leaving no resources for secondary tasks or distractors. It has been suggested that faces are preferentially processed, regardless of load, but other studies show they are subject to load effects just like any other stimuli. This study uses a letter search task to examine attention to face or object pictures (neutral/ threatening) presented as to-be-ignored distractors. Participants (N=46) were high or low in social anxiety, which is associated with preferential processing of faces, especially threatening ones. Results showed that faces were subject to load effects. Socially anxious participants had slower RTs to the task when distractors were threatening than neutral, irrespective of their types (faces or objects). Results are discussed in light of load theories and social anxiety theories.

OS2.TAR.5 DEVELOPMENTAL DIFFERENCES IN GAZE PROCESSING: A 'JOINT DISTRACTION' EFFECT

Aranda-Martín, B., Lupiáñez, J., & Ballesteros, M.A.

University of Granada, Spain

Presenting author: Belén Aranda-Martín

A gaze, besides orienting attention, provides valuable social information. Lately, the effects produced by arrows and gazes have been qualitatively dissociated using a stroop paradigm showing that the classical congruency effect presented by arrows is reversed when the stimulus is a gaze. Socio-cognitive mechanisms could be at the base of such dissociation. Through this study, we intend to explore the differences in the processing of both stimuli in three age groups (4, 5 and 6 years). If there is a social explanation behind the effect, it should emerge during infancy, becoming more pronounced as social development improves. Results show that, whilst the congruency effect produced by arrows is present in all three groups, the reversed effect of the gaze emerges gradually, becoming more evident at the age of 6. This study sheds light on gaze processing, leading to a further investigation of socio-cognitive processes in childhood.

OS2.TAR.6 INDIVIDUAL DISPOSITIONS PREDICT GOAL PRIORITY DURING THE RECOGNITION OF OTHERS' ACTIONS

Decroix, J.¹, Morgado, N.², & Kalénine, S.¹

1 Univ. Lille, CNRS, CHU, Lille, France; 2 University of Paris Nanterre, Nanterre, France

Presenting author: Jérémy Decroix

According to predictive models of action understanding, observers would decode goal-related information before processing the visual kinematics when recognizing others' actions. Such models have been supported by recent action priming results showing earlier priming for object-directed actions sharing similar goals than similar grips (Decroix & Kalénine, 2018). Yet goal priority in action recognition could be modulated by situational (e.g., visual context) and individual factors. In the present study involving 64 young adults, we evaluated whether several social and cognitive individual dispositions of the observer (e.g., Perspective Taking, Sense of Social Power) could influence goal priority in a similar action priming paradigm. Results showed that the way we relate to others (e.g. perspective taking abilities) predict goal priority during the recognition of basic hand-object interactions (e.g., writing with pen). Findings suggest to incorporate the social characteristics of the observer in cognitive models of action understanding.

OS2.TAR.7 BRAIN ACTIVITY DURING TRANSITIVE AND SOCIAL ACTION OBSERVATION IN ADULTS AND ADOLESCENTS

Lesourd, M.¹, Afyouni, A.¹, Gerinswald, F.¹, Raoul, L.¹, Cignetti, F.², Sein, J.¹, Nazarian, B.¹, Anton, J.-L.¹, & Grosbras, M.-H.¹

1 Aix-Marseille Université; 2 Université Grenoble Alpes

Presenting author: Mathieu Lesourd

The Action Observation Network (AON) is a set of brain areas consistently engaged during the observation of other's actions. While the core nodes of the AON are present since early adolescence, it is not known to what extent they are sensitive to different features of the observed action. Twenty-seven typically developing adolescents and twenty-two adults were enrolled in a fMRI study and were asked to passively observe videos of hand actions varied along two factors: sociality (social/non-social) and transitivity (transitive/intransitive). Univariate analyses showed that observing actions recruits similar fronto-parietal and occipito-temporal networks to the same extent in both adults and adolescents. However, multivariate analyses revealed an interaction in the right posterior superior temporal sulcus, indicating that social actions are less-well represented in adolescents compared to adults. These results suggest that the adolescent brain is specifically less sensitive than the adult brain to the social information conveyed by the action.

Barcelona Room

Arithmetics I

OS2.BAR.1 MODAL-INDEPENDENT PATTERN RECOGNITION DEFICIT IN DEVELOPMENTAL DYSCALCULIA ADULTS: EVIDENCE FROM TACTILE AND VISUAL ENUMERATION

Cohen, Z.Z., Gliksman, Y., & Henik, A.

Ben-Gurion University of the Negev, Israel

Presenting author: Zahira Ziva Cohen

Developmental dyscalculia (DD) is characterized by lower numerical and finger-related skills. Studies of enumeration among those DD that suggested core deficiency in pattern recognition, working memory or/and attention, were mostly carried out in the visual modality. In our study, we examined tactile (vibration to the fingertips) and visual (dots) enumeration of 1-10 stimuli among DD and matched-control adults. We used 800 ms stimuli exposure time of either random/non-neighboring fingers or canonical/neighboring fingers arrangements. The visual exposure time enabled us to explore pattern recognition effects when working memory and attention loads were low. Compared to controls, DD participants showed smaller visual subitizing range and less accurate performance in pattern recognition condition (canonical/neighboring presentation) in both visual and tactile enumeration. We discuss possible modal-independent deficits in pattern recognition and working memory on enumeration performance among those with DD and the unique role of fingers in ordinal and cardinal representation of numbers.

OS2.BAR.2 THE LARGEST-ADDEND EFFECT IN ALPHABET-ARITHMETIC VERIFICATION TASK

Dewi, J. & Thevenot, C.

University of Lausanne, Switzerland

Presenting author: Jasinta Dewi

Studies on alphabet-arithmetic verification (e.g. $A + 3 = E$; true or false?) have shown a recurrent phenomenon that after a period of training, the increase in solution times as a function of addends is systematically followed by a decrease in solution times for problems with the highest addend, irrespective of its size. Our results in two alphabet-arithmetic verification trainings revealed that this decrease in solution times is due to the particularities of largest-addend problems, which make them particularly salient for

memorisation, and that the sensitivity to this salience depends on participants' short-term memory capacities. By analysing the false equations, we unveiled that the disappearance of the so-called opportunity stopping (i.e. the fact that letters preceding the answer are rejected faster than those following it) at the end of training found in an earlier study, taken as another proof of retrieval-based performance, was merely due to this largest-addend effect.

OS2.BAR.3 UNRAVELLING THE MECHANISMS OF SYMBOLIC AND NON-SYMBOLIC MAGNITUDE DISCRIMINATION WITH FREQUENCY-TAGGING EEG

Van Rinsveld, A.¹, Guillaume, M.¹, Poncin, A.², Schiltz, C.², Gevers, W.¹, & Content, A.¹

1 Université Libre de Bruxelles, Belgium; 2 University of Luxembourg, Luxembourg

Presenting author: Amandine Van Rinsveld

We assessed the human ability to discriminate magnitude information from both symbolic (i.e. digits) and non-symbolic material (i.e. dot patterns) with a frequency-tagging EEG approach. We used a specific fast periodic visual stimulation (FPVS) paradigm entailing a periodic change of magnitude at 1.25 Hz. We observed a neural response at that frequency for both symbolic and non-symbolic periodic changes, suggesting a magnitude discrimination in both cases. In the non-symbolic experiments, we observed a specific neural discrimination of numerosity and total area of the dot patterns in medial occipital electrodes, showing that numerosity but also continuous magnitude can be early extracted along the visual stream. In the symbolic experiments, neural synchronization on magnitude and parity digit changes occurred in lateralized occipito-parietal regions. Taken together, the FPVS paradigms allowed us to track the neural correlates of symbolic and non-symbolic magnitude processing with a method requiring no instructions and only short testing sessions.

OS2.BAR.4 TYPICAL BASIC NUMERICAL ABILITIES DESPITE CONGENITAL ABSENCE OF SENSORIMOTOR FINGER EXPERIENCE

Andres, M., Pesenti, M., & Vannuscorps, G.
Université catholique de Louvain, Belgium
 Presenting author: Michael Andres

Fingers help children learning to count but whether this sensorimotor experience is necessary to develop efficient basic numerical abilities is unclear. We tested DC, an adult with a congenital absence of seven fingers, in tasks that required processing numbers (comparison, calculation) or words (rhyme judgement). We compared numerical tasks involving fingers during normal development (addition, subtraction) to tasks less related to fingers (multiplication), and measured classical effects related to shared properties of numbers and fingers (order, base). Response speed and accuracy were within the range of ten control participants matched for age and education, and we found no difference between tasks related and unrelated to finger counting. DC showed typical performance and evidenced classical order and sub-base-five effects. To keep the count of invisible elements, DC relied on his toes while controls used their fingers. Thus, finger sensorimotor experience is not necessary for the development of efficient basic numerical abilities.

OS2.BAR.5 COMPARING DIFFERENT TASKS FOR MAGNITUDE ESTIMATION IN MENTAL ARITHMETIC

Felisatti, A.¹, Shaki, S.², & Fischer, M.H.¹
1 University of Potsdam, Germany; 2 Ariel University, Israel
 Presenting author: Arianna Felisatti

Estimating number positions on a horizontal line assesses cognitive magnitude representations. We studied effects of heuristics on such estimations, comparing zero- and non-zero arithmetic problems (e.g., 4+0 vs 3+1). Adult left-to-right-readers estimated positions of single digits and of arithmetic addition and subtraction results in 3 tasks: shifting marker (SM: larger=right movement), shifting line (SL: larger=left movement), or bi-directional line length-production (LP: bi-directional movement). All tasks yielded larger estimates for subtraction than addition with non-zero problems, with a stronger effect in SM than SL. LP yielded larger overall estimates and smaller constant errors than SL or SM, which did not differ. The results show that magnitude estimates are relatively robust across methods. They can inform the Arithmetic-Heuristics-And-Biases model of mental arithmetic (Shaki et al., 2018).
 Reference:

Shaki S et al., *Think Reasoning* (2018), 24(2), 138-156.
 Funding: DFG FI_1915/8-1 "Competing heuristics and biases in mental arithmetic".

OS2.BAR.6 ACCESSING NUMERICAL REPRESENTATIONS THROUGH FINGER-CONFIGURATIONS

Vanstavel, S., Coello, Y., & Mejias, S.
Université de Lille
 Presenting author: Sandrine Mejias

In everyday life, finger-configurations are commonly used to communicate about quantities, for example, when asking the bartender to bring "three more beers". But how do we access numerical representations from fingers-configurations? It has been suggested that finger-configurations are automatically processed as symbols, similarly to Arabic digits. Here we used EEG recording coupled with a Fast Periodic Visual Stimulation approach to study high-level semantic visual processing (i.e., accessing numerical representations). Participants were passively exposed to small numerosities (2-to-4) presented either through finger-configurations, Arabic digits or dots set. This technique provides a direct comparison of neural response patterns of each category of stimuli and clarify the finger-configurations status. Results indicate that fingers-configurations and Arabic digits are automatically discriminated within the occipito-parietal cortex (as symbols), while dots were processed within the occipital cortex (as analog magnitude). Given its high sensitivity, the present method could provide an implicit neural marker suitable for clinical applications.

OS2.BAR.7 SPACE AND NUMBERS IN THE JUNGLE: DIRECTIONAL SPATIAL-NUMERICAL ASSOCIATIONS IN INDIGENOUS AMAZON PEOPLE TSIMANE'

Cipora, K.¹, Soltanlou, M.¹, Gibson, E.A.², & Nuerk, H.-C.¹
1 University of Tuebingen, Germany; 2 Massachusetts Institute of Technology, USA
 Presenting author: Krzysztof Cipora

Majority of studies aiming to provide general account on human cognition have been conducted in Educated and Industrialized societies. The same holds true for studies in numerical cognition investigating directional Spatial-Numerical Associations. In this study, we tested a group (N = 123) of Tsimane' people – a non-industrialized society living in Bolivian rainforest. They were presented with six cards with different numerosities (1-6 elements), and asked to arrange them inside a horizontal and a vertical grid. Interestingly, in both conditions the proportions of individuals, who used left-right vs. right-left / bottom-top vs. top bottom arrangements were relatively close. Additionally, in both conditions about 20% of individuals did not use space-related arrangement. There was no relation between horizontal and vertical arrangements. Results will be discussed in the context of current theories of Spatial-Numerical Associations.

Palma de Mallorca Room

Time Processing

OS2.PAL.1 COMBINING SPATIAL AND TEMPORAL EXPECTANCIES TO IMPROVE VISUAL PROCESSING

Charras, P.

University Paul Valéry Montpellier 3; University of Montpellier, Montpellier, France

Presenting author: Pom Charras

Attention can be voluntarily oriented towards a spatial location to improve sensory information processing. Additionally, sensory processing can be enhanced if knowing when an event is about to occur. In the present talk, I will present a series of behavioral studies conducted to investigate to what extent both the spatial and temporal information was efficiently used to improve performance. In these studies spatial and temporal expectancies were combined, such that participants could predict where in space but also when in time an event was more likely to appear. Given the discrepancy in the literature, we manipulated task demands by asking participants to simply detect target appearance or to discriminate target stimulus. Our results reveal that, in both the detection and discrimination tasks, participants did use spatial and temporal information to respond faster and more accurately, therefore suggesting independent processes that give rise to additive effects.

OS2.PAL.2 THE REPRESENTATION OF TIME AND SPACE IN THE BRAIN: A META-ANALYSIS OF NEUROIMAGING STUDIES ON TEMPORAL AND SPATIAL PROCESSING

Cona, G.¹, Wiener, M.², & Scarpazza, C.¹

1 University of Padova, Padova, Italy; 2 George Mason University, Fairfax, VA, US

Presenting author: Giorgia Cona

Time and space are fundamental dimensions for our cognition. Despite they are intrinsically different, they share several features and show some overlapping brain activations. Supplementary Motor Area (SMA) stands among these, representing a core region for both temporal and spatial processing. Which regions are co-activated with SMA to support temporal and spatial tasks, respectively? We conducted a meta-analysis using the activation likelihood estimation algorithm (GingerAle software). We included 847 activation foci across 62 studies of time and 884 foci across

61 studies of space. We observed overlapping activations between time and space in SMA and in bilateral insular regions. In temporal tasks, other brain regions co-activated with SMA are located in the cerebellum, basal ganglia, inferior frontal and left parietal regions. In spatial tasks, brain regions co-activated with SMA are located in dorsal fronto-parietal regions and fusiform gyri. These distributed networks play a key role in time and space representation.

OS2.PAL.3 BEEP ME UP: NON-SPATIAL TONES INCREASE PERCEIVED SPEED OF VISUAL OBJECTS

Meyerhoff, H.S.¹, & Gehr, N.A.²

1 Leibniz-Institut für Wissensmedien, Tübingen, Germany;

2 University of Tübingen, Germany

Presenting author: Hauke S. Meyerhoff

Coinciding auditory information alters early processing of visual scenes. Here, we investigate a new audio-visual illusion: Coinciding tones increase the perceived speed of moving visual objects. Our participants judged which of two objects moved faster. Each object changed its direction of motion, however, the direction changes of one of the objects were accompanied by spatially uninformative tones. Whereas the audio-visual object moved at a constant speed of 4.5 deg, the speed of the visual object varied from 2.75 to 6.25 deg. We measured the point of subjective equality, which indicated that the audio-visual object was perceived to move 6-9% faster than the visual object. The effect persisted with prevented eye-movements and across different volumes. Guiding visual attention to one object revealed a similar effect; but mere coincidence of visual cues did not. Thus, the increase in perceived speed stems from guidance of spatial visual attention by temporally coincident non-spatial sounds.

OS2.PAL.4 SPATIOTEMPORALLY MODULATED STIMULI LEADS TO A SYMMETRICAL INTERACTION BETWEEN TIME AND NUMEROSITY

Togoli, I. & Buetti, D.

International School for Advanced Studies (SISSA), Italy

Presenting author: Irene Togoli

Time and numerosity are stimulus dimensions influencing our perception – e.g., the greater the number of people queuing at a counter, the longer the time we expect to wait. Whereas the presence of these perceptual biases is known, their directionality (i.e., whether it is symmetrical) is controversial. Here we assess the time-numerosity interaction using visual stimuli in which the two dimensions were varied together. In different experiments, we used either static or dynamically changing stimuli, whereby temporal and numerical cues are more likely integrated throughout the stimulus presentation. Participants judged either stimulus duration, total, or average numerosity over time. With static stimuli, we observed an interaction between the two dimensions with a stronger bias provided by numerosity. Using dynamic stimuli, we showed a perfectly symmetrical interaction, with total duration and average numerosity over time as factors biasing perception. These results provide novel evidence for a symmetrical interaction between these two magnitudes.

OS2.PAL.5 PLEASE DON'T STOP THE MUSIC: A META-ANALYSIS OF THE BENEFITS OF EARLY MUSICAL PRACTICE ON ACADEMIC ACHIEVEMENT AND COGNITION

Román-Caballero, R.¹, Vadillo, M.A.², & Lupiáñez, J.¹

1 University of Granada, Granada, Spain; 2 Autonomous University of Madrid, Madrid, Spain

Presenting author: Rafael Román-Caballero

The interest in the effects of musical practice on cognitive and academic outcomes has increased. However, recent meta-analyses have shown inconsistent results, perhaps due to the vague definition of musical training. The current meta-analysis investigates the impact of early programs that actually involve learning to play musical instruments. Following a systematic review search, 35 independent samples of children and adolescent were included. All used experimental designs with control groups. We found small-to-medium improvements in several functions (intelligence, memory, visuospatial abilities and phonological processing) and literacy. Heterogeneity was low for most of them and there was little evidence of publication bias (which was mainly restricted to studies with lower design quality). Importantly, studies with randomized samples and active control groups showed a similar effect. These results are consistent with a far-transfer approach of musical practice, thus supporting the conclusion that learning to play an instrument could benefit cognition and academic skills.

OS2.PAL.6 A MOMENTUM EFFECT IN TEMPORAL ARITHMETIC

Bonato, M.^{1,2}, D'Ovidio, U.^{1,2}, Fias, W.², & Zorzi, M.^{1,3}

1 University of Padova, Italy; 2 Ghent University, Belgium; 3 IRCCS San Camillo Hospital, Lido Venice, Italy

Presenting author: Mario Bonato

The mental representation of brief temporal durations, when assessed in standard laboratory conditions, is reliable and surprisingly accurate. Here we show for the first time that adding or subtracting temporal durations systematically induces strong and opposite distortions, with underestimation for subtraction and overestimation for addition, as opposed to comparatively accurate temporal reproduction of the same durations. The sizeable difference found between operations was stable across durations and was still reliably present when correcting for the effect due to operation sign alone, indexing a reliable signature of arithmetic processing on time representation. This novel behavioral marker conceptually mirrors in the time domain the representational momentum, whereby the estimated spatial position of a moving target is displaced in the direction of target motion itself. This momentum effect in temporal arithmetic suggests a new and surprising analogy between time processing and visuospatial processing, which might index the presence of common computational principles.

OS2.PAL.7 AN ILLUSORY MOTION IN STATIONARY STIMULI ALTERS THEIR PERCEIVED DURATION

Contemori, G.^{1,2} & Battaglini, L.¹

1 University of Padova, IT; 2 Centre de Recherche Cerveau & Cognition (CerCo), Toulouse, FR

Presenting author: Giulio Contemori

Moving objects are perceived to last longer than static ones of equal duration. Here, we compare the perceived duration of two sets of static stimuli, one that elicits and one that does not elicit a perception of illusory motion. We used peripheral drift images composed of repeating asymmetric patterns (RAP) in which the illusory motion is controlled through a change in the physical orientation of the local elements. Both illusory and non-illusory images are created by the same local elements reorganized differently so that to balance out the total amount of visual stimulation in the two patterns. We estimated the point of subjective equality (PSE) and the slope of the psychophysical functions in a temporal discrimination task. The illusion shifted the PSE towards a shorter duration but caused no change in the slope. To conclude, like real motion, even the illusory motion alters the perceived duration by expanding it.

ABSTRACTS
ORAL SESSION 3

Saturday 28th

13:10-14:30

Auditorio

Robots

OS3.AUD.1 PSYCHOPHYSIOLOGICAL RESPONSES TO EYE CONTACT IN VIRTUAL REALITY AND IN LIVE INTERACTION
Syrjämäki, A.H., Isokoski, P., Surakka, V., Pasanen, T.P., Helminen, T.M., Peltola, M.J., & Hietanen, J.K.
Tampere University, Finland
Presenting author: Aleksi Syrjämäki

We investigated whether eye contact would evoke similar psychophysiological responses in virtual reality (VR) as in a face-to-face interaction. Participants (N = 40) viewed a confederate in a live interaction (Live condition) and a confederate's avatar in VR (VR condition). In both conditions, the confederate/avatar was portraying direct and laterally averted gaze. In the Live condition, skin conductance reflecting affective arousal was greater in response to direct than averted gaze. In the VR condition, however, there were no differences in skin conductance responses to direct and averted gaze. Instead, heart rate deceleration responses reflecting attention orienting were greater to direct gaze compared to averted gaze in both Live and VR conditions. These results suggest that while eye contact engages visual attention similarly when interacting with a live confederate and a confederate's avatar in VR, only eye contact with a live person increases affective arousal.

OS3.AUD.2 HUMAN-LIKE ERRORS IMPAIR SYNCHRONIZATION IN A JOINT TASK WITH A ROBOT
Ciardo, F., De Tommaso, D., & Wykowska, A.
Istituto Italiano di Tecnologia (IIT), Italy
Presenting author: Francesca Ciardo

In the present study, we examined whether human-like behavior of a robot affects the way humans perform a joint task with the robot. Participants performed a synchronized tapping task with the humanoid robot iCub. iCub's was programmed to make a mistake in 60% of the trials. For half of the participants, in the erroneous trials, iCub pressed the wrong key (Human-like error), whereas for the other half of participants iCub interrupted the task and moved back and forth between two keys (Mechanical error). Results showed that overall participants were less accurate (higher error rate and lower period performance) for the Human-

like than the Mechanical condition. When iCub performed the task correctly, however, the variability in the asynchrony between the robot's and participants' mean periods was higher for the Human-like than for the Machine-like error context. Our results show that human-likeness of a robot behavior affects synchronization in a joint task.

OS3.AUD.3 HUMAN MACHINE INTERACTION: A PROBLEM OF AGENCY
Sahaï, A.^{1,2}, Pacherie, E.², Grynszpan, O.³, & Berberian, B.¹
1 The French Aerospace Lab, France; 2 ENS, France; 3 Université Paris-Sud, France
Presenting author: Bruno Berberian

The sense of agency experienced in joint action is thus a central subjective dimension of human sociality. In a series of 3 experiments, we explore the development of we-agency when interacting with robot. Combining a Social Simon task with the intentional binding effect, we explore (1) the emergence of self and we-agency in joint action and (2) the impact of the nature of the partner (human Vs Social robot Vs Computer) on the development of we-agency. Our two first experiments show that a vicarious sense of agency developed when co-acting with another human agent but not with a computer. Moreover, EEG data indicated a decrease in task involvement when engaged in human-computer interaction. A third experiment shows that the social nature of the artificial agent can modulate the development of we-agency, but also that the emergence of a we-unit can alter the development of the self-agency.

OS3.AUD.4 USING HUMANOID ROBOTS TO TEST FLEXIBILITY OF HUMAN SOCIAL COGNITION

Wykowska, A.¹, Kompatsiari, K.^{1,2}, Schellen, E.¹, Bossi, F.¹, & Ciardo, F.¹

1 Istituto Italiano di Tecnologia (IIT), IT; 2 Ludwig-Maximilians-Universität (LMU), DE

Presenting author: Agnieszka Wykowska

In this presentation, I will argue that using embodied humanoid robots in interactive experimental protocols allows not only for high ecological validity together with excellent experimental control, but it also provides the opportunity to test if mechanisms of human social cognition are flexible enough to be elicited not only by natural but also by artificial agents. I will present results of several studies in which we examined mechanisms of human cognition during interaction with humanoid robots. Our results show that mutual gaze with a robot is interpreted in a social way, increasing participants' engagement in joint attention (Experiment 1) and honesty (Experiment 2). Furthermore, embodied presence of a robot has an impact on participants' sense of agency (Experiment 3). These results support the idea that humanoid robots can be represented by the human cognitive system as social entities, thereby indicating flexibility of social cognition.

Cibeles Room

Face Processign

OS3.CIB.1 DOES FACE FAMILIARITY INFLUENCE ATTENTIONAL REFRESHING IN VISUAL WORKING MEMORY?

Schneider, P.¹, Vergauwe, E.², & Camos, V.¹

1 University of Fribourg, Switzerland; 2 University of Geneva, Switzerland

Presenting author: Philippe Schneider

Attentional refreshing has been defined as the main maintenance system in working memory (WM), using domain-general attentional resources to keep visual as well as verbal information active for a short period of time. However, its functioning is not well understood. One assumption is that it would rely, at least in part, on retrieval from long-term memory (LTM). The familiarity effect, a LTM effect, is known for influencing performance in WM tasks, with more familiar items yielding better performance. In a series of experiments, we investigated the hypothesis that more familiar items would be refreshed more efficiently than the less familiar ones. To that aim, we systematically manipulated refreshing opportunities and familiarity in two visual WM tasks. We manipulated face familiarity by using the well-established Own-Race Effect, where faces from our own ethnicity are better recalled than faces from other ethnicities. Results and their implications for WM theories will be discussed.

OS3.CIB.2 TYPICAL FACIAL EXPRESSION RECOGNITION WITHOUT MOTOR SIMULATION

Vannuscorps, G.^{1,2}, Andres, M.², & Caramazza, A.¹

1 Harvard University, U.S.A; 2 Université catholique de Louvain, Belgium

Presenting author: Gilles Vannuscorps

Perceiving others' movements activates imitative motor plans in the observer. This led to the idea that efficient interpretation of others' movements, such as their facial expressions, requires covert imitation of these movements, a "motor simulation". If so, then, individuals born with congenital bilateral facial paralysis and thus never developed motor representations that could be mobilized to covertly imitate facial movements, should interpret facial movements less efficiently than typically developed participants. We report the results of five experiments assessing

different aspects of facial expression recognition in eleven individuals born with bilateral congenital facial paralysis. Their patterns of performance were indistinguishable from that of typically developed individuals. Thus, efficient action interpretation does not require motor simulation.

OS3.CIB.3 QUANTITATIVELY ANALYZING THE TIME COURSE OF FACE LEARNING: AN ERP STUDY

Kotowski, K.¹, Stapor, K.¹, & Sommer, W.²

1 Silesian University of Technology, Poland; 2 Humboldt-University at Berlin, Germany

Presenting author: Krzysztof Kotowski

The development of the stable face representation in the brain is a long-term cognitive process that is not thoroughly examined in the literature. Previous ERP studies have identified the N250 component as the main correlate of face familiarity. The amplitude of this component is known to decrease during demanding tasks of face learning or recognition, like the Joe/No Joe task. However, previous articles analyse only the average amplitude differences between two, three or four consecutive parts of the experiment. Our work refines these analyses by quantitative assessment of the N250-based time course of face learning based on the replicated Joe/No Joe experiment. After the process of selection of a proper trend model and a proper number of parts on which to divide the experiment, our initial results support the hypothesis of a linear characteristic of this face learning curve.

OS3.CIB.4 DISSOCIATED EFFECT OF FACIAL EXPRESSION PRESENTED AT THE PERCEPTUAL THRESHOLD ON COMFORT SOCIAL DISTANCE AND ELECTRODERMAL ACTIVITY

Cartaud, A., Ott, L., Honoré, J., & Coello, Y.

University of Lille, France

Presenting author: Alice Cartaud

We aimed to test whether facial expressions could modulate comfort social distances and the electrodermal response (EDA) when presented at the perceptual threshold. For this, we first established the individual perceptual

threshold of the participants while they had to discriminate the facial expression (angry, neutral or happy) displayed on a 4x2m stereoscopic screen. In the second task, a new set of faces were displayed at their individual threshold before presenting a Point-Light Walker (PLW) moving towards them and crossing them at inter-shoulder distances. EDA was recorded while they had to judge whether the PLW was crossing at a comfortable distance or not. Finally, participants estimated the valence and arousal of the faces. Results revealed an effect of facial expressions on the comfort distances but no effect on the EDA suggesting that implicit induction of an emotional state affects social judgment but not automatic physiological response.

Estambul Room

Language Processign II

OS3.EST.1 SEMANTIC PREVIEW BENEFIT AND COST: EVIDENCE FROM PARAFOVEAL FAST-PRIMING

Laubrock, J.¹, Pan, J.^{1,2}, & Yan, M.^{1,3}

1 University of Potsdam, Germany; 2 The Education University of Hong Kong, China; 3 University of Macau, China

Presenting author: Jochen Laubrock

Recent studies have demonstrated that semantically related parafoveal previews can either facilitate or interfere with lexical processing of a target word. The exposure time to parafoveal previews (i.e., preview duration) has been shown to influence the size and direction of parafoveal semantic effects. However, evidence to date is only correlational. In two experiments, we experimentally manipulated preview duration. Using a combination of the gaze-contingent fast-priming and boundary paradigms, we systematically examined the time course of parafoveal semantic activation during the oral reading of Chinese sentences. Semantic previews led to facilitation in lexical access of target words only when the previews were presented briefly (80 ms). Longer exposure time (100 ms or 150 ms) eliminated semantic effects, and full preview without duration limit resulted in preview cost, i.e., a reversal of preview benefit. Results suggest that the size and direction of parafoveal semantic effect depends on the level of lexical activation.

OS3.EST.2 ON THE INTERPLAY BETWEEN MOTOR SEQUENCING AND LINGUISTIC SYNTAX: ELECTROPHYSIOLOGICAL EVIDENCE

Casado, P.^{1,2}, Martín-Loeches, M.^{1,2}, Muñoz, F.^{1,2}, Hernández-Gutiérrez, D.¹, Jiménez-Ortega, L.^{1,2}, Sánchez-García, J.¹, Espuny, J.¹, & Fondevila, S.^{1,2}

1 Center for Human Evolution and Behavior, UCM-ISCIII, Spain; 2 Complutense University of Madrid, Spain.

Presenting author: Pilar Casado

In this study, we combined two different sequential motor tasks, linear vs. non-linear self-administration of sentences, with correctness judgment of the latter, which could include a morphosyntactic violation, while recording

brain electrical activity. The sentences could be of three types: subject-relative sentences, embedded PP sentences or coordinate subject sentences. Overall, results revealed significant modulations in the ERP components, connected to the number of different actions involved in both the motor task and the sentence. The motor task seemed always to hamper the occurrence of early syntactic processes, as no frontal negativities could be observed. The latter were replaced by lexico-semantic processing when motor and sentential structures matched, as reflected in the appearance of an N400 effect. In turn, a mismatch in this regard seemed to completely impede the appearance of any type of early processing. The present findings extend support that syntax and motor task computations draw upon interdependent resources.

OS3.EST.3 THE REPRESENTATION OF SYNTACTIC FEATURES: CROSS-LINGUISTIC EVIDENCE

Wang, M.¹, Chen, Y.², & Schiller, N.O.²

1 Shandong University, Jinan, China; 2 Leiden University, Leiden, The Netherlands

Presenting author: Niels Schiller

To produce a word, speakers need to retrieve the lexico-syntactic representation of the word and encode the phonological form for articulation. It is not precisely known yet if a word's syntactic features (e.g., number, gender, etc.) are automatically activated and selected in bare noun production. Cubelli, Lotto, Paolieri, Girelli, and Job (2005) proposed that only in languages that have a complex morphological structure (e.g., Italian), the selection of grammatical gender is required. In languages with a relatively simpler morphological structure, the selection of grammatical gender is by-passed. Here, we investigated this issue further by employing a language with an extremely simple morphological structure, i.e., Mandarin Chinese. Using the picture-word interference paradigm, we manipulated the congruency of the lexico-syntactic classifier feature (comparable to grammatical gender) between the target picture and the superimposed distractor word. We measured participants' naming latencies and their electroencephalo-

gram (EEG). As a result, relative to the classifier-congruent condition, classifier incongruency elicited a stronger N400 effect in the ERP analyses, suggesting the automatic activation of lexico-syntactic features in bare noun production. However, classifier congruency did not affect naming latencies, suggesting that the lexico-syntactic feature is not selected in bare noun naming when it is irrelevant for production.

OS3.EST.4 ASSESSING INDIVIDUAL DIFFERENCES IN LANGUAGE PROCESSING: A NOVEL RESEARCH TOOL

Hintz, F.¹, Jongman, S.R.², Dijkhuis, M.³, Van 't Hoff, V.⁴, McQueen, J.M.⁴, & Meyer, A.S.⁵

1 Max Planck Institute for Psycholinguistics, NL; 2 Radboud University, NL

Presenting author: Florian Hintz

Individual differences in language processing are prevalent in our daily lives. However, for decades, psycholinguistic research has largely ignored variation in the normal range of abilities. Recently, scientists have begun to acknowledge the importance of inter-individual variability for a comprehensive characterization of the language system. In spite of this change of attitude, empirical research on individual differences is still sparse, which is in part due to the lack of a suitable research tool. Here, we present a novel battery of behavioral tests for assessing individual differences in language skills in younger adults. The Dutch prototype comprises 29 subtests and assesses many aspects of language knowledge (grammar and vocabulary), linguistic processing skills (word and sentence level) and general cognitive abilities involved in using language (e.g., WM, IQ). Using the battery, researchers can determine performance profiles for individuals and link them to neurobiological or genetic data.

Atenas Room

Emotion and Attention

OS3.ATE.1 PROACTIVE CONTROL OF AFFECTIVE DISTRACTION: EXPERIENCE-BASED BUT NOT EXPECTANCY-BASED

Schmidts, C., Foerster, A., & Kunde, W.

University of Würzburg, Germany

Presenting author: Constantin Schmidts

Unpleasant stimuli disrupt ongoing information processing, even when they are entirely task-irrelevant. We examined whether such affective disturbances can be controlled proactively. We examined experience-based control by manipulating the frequency of affective distractors, and expectancy-based control by presenting predictive valence cues. We predicted that both mechanisms would shield the attentional system from affective disturbance. Participants solved a letter classification task while being exposed to neutral or negative distractor pictures. We varied whether the proportion of negative distractors was low or high and whether cues were informative or uninformative. In two experiments (N = 75), we found support for the notion that experience-based control shields information processing from affective disturbances, whereas distractor valence expectations were neither helpful nor harmful. There appears to be no explicit top-down influence on attentional control settings of affective distraction, just adjustments to the context.

OS3.ATE.2 ALERT: ATTENTION IS ENHANCED PRIOR TO ANY UPCOMING STIMULUS, REGARDLESS OF ITS EMOTIONALITY

Makovski, T. & Chajut, E.

The Open University of Israel

Presenting author: Tal Makovski

A recent study has found that people do not inhibit distractors in advance. Instead, attention is more alerted when observers are expecting the presentation of an upcoming stimulus, even if it is surely distracting. Here we asked whether threat, which is an evolutionary important signal that known to modulate attention after its appearance, would elicit a different preparation effect prior to its appearance. Thus, participants performed a change-detection task while expecting that at a fixed moment in time a

neutral, a threatening, or no stimulus would appear. Replicating previous findings, responses to an infrequent dot-probe were faster when it appeared when participants were expecting a distracting stimulus. Importantly, however, whereas only threatening stimuli impaired performance in the change-detection task, the expectation effect for threatening and neutral stimuli was the same. These results suggest that the visual system is not more alerted in the face of a threat.

OS3.ATE.3 CONTRASTING DIS-/ENGAGEMENT OF SPATIAL ATTENTION IN DISGUST AND FEAR IN PREDICTIVE VERSUS COUNTER-PREDICTIVE CUEING

Zimmer, U., Wendt, M., Pacharra, M., Heinrichs, F.G., Krone, K., & Bremer, P.

Medical School Hamburg (MSH), Germany

Presenting author: Ulrike Zimmer

Using a predictability of 50% valid/invalid cues, our recent studies indicated that disgust in contrast to other negative emotions directs our attention away as mirrored in slower responses and enhanced P3-activity to same-sided versus opposite targets. Here we asked if top-down (expectancy-based) shifts of attention mediate emotional avoidance/attraction. In an ERP-study, a lateralized facial emotion cue (disgust/fear/neutral) preceded a lateralized white triangle target with a SOA of 200ms or 800ms. In the predictive condition, 75% of the cues were valid, in the counter-predictive 75% were invalid. Participants signaled the direction of the triangle (up/down). Behavioral results indicated an interaction of predictability with emotion, specifically driven by disgust in the counter-predictive condition. ERP-results showed an interaction of emotion by SOA at P3, again pronounced in the counter-predictive condition. Our results suggest stronger disengagement from the location of a disgust-related cue, mediated by top-down (expectancy-based) shifts of attention or Inhibition of Return.

OS3.ATE.4 ATTENTIONAL BIAS DUE TO EMOTIONS AND
WORD PROCESSING IN BINGE-DRINKING: AN ERPS STUDY

Gobin, P.^{1,2}, Gierski, F.^{1,2,3}, Benzerouk, F.^{1,2}, Barrière, S.², &
Kaladjian, A.^{1,2}

*1 Université de Reims Champagne-Ardenne, France; 2 Pôle
Universitaire de Psychiatrie EPSMM, France; 3 Université
de Picardie Jules*

Presenting author: Pamela Gobin

We investigated whether the automatic emotional processing, impacting early attentional and later lexico-semantic processes, would be affected by binge-drinking, according to the word-association with alcohol. Recent studies have shown an emotional recognition impairment. Other studies have highlighted an attentional focus towards items linked to alcohol, but without taking into account word emotionality. Thus, 20 binge-drinkers and 20 control participants (10 males/10 females) performed a lexical decision task, with emotional (negative/positive) and neutral words, related or not to “alcohol”, while EEG was recorded. Results showed a significant effect of emotionality, of association, and of interaction between group, sex and emotionality or association, both on early (N1/N2/P2/P3) and on later components (N400/P600), depending on considered valence. Therefore, emotional valence and association with “alcohol” would influence attention allocation, which leads to a specific cognitive resource distribution for lexical activation and for semantic integration, modulated by alcohol consumption but differentially for men and women.

St Tropez Room

Memory

OS3.StT.1 POSITIVE AND NEGATIVE EFFECTS OF OVERT VERSUS COVERT MEMORY RETRIEVAL

Pansky, A., Sagi, J., & Morad, L.

University of Haifa, Israel

Presenting author: Ainat Pansky

Interpolated memory testing has been shown to yield positive effects on later retention (i.e., the testing effect) but some negative effects as well (e.g., forced confabulation effects). In this study, we examined the extent to which each of these effects is due entirely to retrieval practice, or whether overt reporting of the retrieved information makes an additional contribution. Participants were asked both answerable and unanswerable questions about a viewed event, either once (Experiment 1) or repeatedly (Experiment 2), retrieving the answers either covertly or overtly. Our procedure was especially designed to encourage actual retrieval whether or not an overt response was solicited. We found comparable effects of overt and covert retrieval, for both answerable and unanswerable questions, resulting in comparable improvements in delayed memory performance (in terms of both completeness and reliability). Our findings support the role of retrieval per se in underlying both positive and negative effects of testing.

OS3.StT.2 USING THE MEMORY MEASUREMENT MODEL IN WM TASKS WITH VISUAL MATERIAL AND n-AFC RECOGNITION RETRIEVALS

Frischkorn, G.T. & Oberauer, K.

University of Zurich, Switzerland

Presenting author: Gidon T. Frischkorn

The memory measurement model (M3; Oberauer & Lewandowsky, 2018) distinguishes three working-memory processes that activate representations for retrieval: baseline activation, unspecific activation of all representations currently stored in WM, and re-activation of representations when cued by a specific context it is bound to (e.g. serial or spatial position). These parameters specify activation for three representation categories: items in position, other list items, and not-presented lures. Additional parameters enable M3 to model how strongly distractors in

complex span tasks are filtered out at encoding, and how efficiently items are removed from memory in updating tasks. So far, the M3 has only been used with verbal material in complex span and updating tasks. We will present a generalization of the M3 to WM tasks with visual materials. In addition, we will explore the suitability of M3 for n-alternative forced choice (n-AFC) recognition retrievals with varying numbers of choice options.

OS3.StT.3 THE EFFECT OF ELABORATION ON MEMORY ACROSS AGE

Bartsch, L.M. & Oberauer, K.

University of Zurich

Presenting author: Lea Bartsch

Previous research has shown that free time to attend to and further process information in working memory is key in promoting WM and long-term memory (LTM, Souza & Oberauer 2017,2018). To investigate whether free time is used for elaboration we conducted two experiments comparing memory performance of young and older adults. Participants remembered lists of nouns, interleaved with short or long free-time intervals, or with filler words connecting all the nouns into a meaningful sentence to assist elaboration. Assisted elaboration benefited WM equivalently to longer free time only when memory load was high and only in young adults. In contrast, LTM benefits of sentence elaboration were larger than of longer free time. Furthermore, older adults benefited from assisted elaborations but never to the degree of younger adults, providing further evidence that the LTM deficit of older adults might arise at least in part from a deficit in elaboration.

OS3.StT.4 AUTOMATIC PROCESSES ON FALSE RECOGNITION: THE ROLE OF BACKWARD ASSOCIATIVE STRENGTH AND PRESENTATION RATE

Suarez, M. & Beato, M.S.

University of Salamanca, Spain

Presenting author: Mar Suarez

Are only automatic processes capable of producing false recognition? We manipulated the presentation rate of study items and the backward associative strength (BAS) in the Deese/Roediger-McDermott paradigm. Participants studied 5 high-BAS and 5 low-BAS lists of associatively related words for a subsequent recognition test. Associates were studied at two presentation rates: fast condition (50ms, visually masked) and slow condition (2000ms, unmasked). Results showed that true recognition dramatically dropped in the fast condition (.79 vs. .31), while false recognition did not differ between conditions (.42 vs. .34). More interestingly, false recognition in low-BAS lists was similar in the slow and fast conditions (.35 vs. .36), whereas high-BAS lists produced higher false recognition in the slow than fast condition (.49 vs. .32). Therefore, very fast automatic processes seem to be responsible for false recognition, but also a little more time was required to observe the full effect of the high associative strength.

Tarraco Room

Visual Attention

OS3.TAR.1 BEHAVIOURAL EVIDENCE FOR MULTIPLE ATTENTIONAL TEMPLATE

Zhou, X., Lorist, M.M., & Mathôt, S.

University of Groningen

Presenting author: Xiaoyi Zhou

During visual search, representations maintained in visual working memory (VWM), which are known as templates, are assumed to be activated to bias attention towards matching visual items. A main debate over this VWM-based capture concerns whether only one (Single-Item-Hypothesis, SIT) or multiple (Multiple-Item-Hypothesis, MIT) templates actively interacts with perceptual processing at a given time to bias attention. The current study was designed to test the two accounts. Participants memorized 2 colors, prior to a visual search task where the target and the distractor matched or did not match the memory. A robust attentional capture was observed when the memory color was presented as the target or the distractor. Consistent with the MIT model, we found that a similar pattern of the RT distribution for both-match trials and no-match trials, showed that both the target-matched and distractor-matched colors draw attention. Critically, simulations of RTs based on the two models in a drift-diffusion model revealed a better match of MIT model to the observed data. Taken together, our findings provided behavioural evidence for the concurrent guidance of multiple items in VWM.

OS3.TAR.2 PARIETAL tACS AT BETA FREQUENCY IMPROVES VISUAL CROWDING

Battaglini, L., Ghiani, A., Casco, C. & Ronconi, L.

University of Padova

Presenting author: Luca Battaglini

Visual crowding is the inability to discriminate objects that are presented with nearby flankers. Beta cortical oscillation in the right parietal cortex seems to be associated with better crowding resilience. The effect of tACS within the beta and alpha range, namely at 18 and 10hz, on a letter crowding task, was tested. An increment in the participants' performance with 18hz-tACS compared to 10hz-tACS and sham stimulation, was measured. This

improvement was found specifically in the hemifield contralateral to the stimulation site and was accompanied by increased amplitude of EEG beta oscillations (resting electroencephalography). Moreover, analysis on a single trial levels reveals that correct discrimination was associated with a specific phase of beta tACS. These results support a causal relationship between beta oscillations and visual crowding and, importantly, provide evidence that tACS at relevant frequencies can improve crowding-related performance.

OS3.TAR.3 APPLYING A SIMILARITY BASED MODEL OF VISUAL SEARCH TO FIXATION DATA AND DUAL TARGET SEARCH

Guest, D.

Nottingham Trent University, UK

Presenting author: Duncan Guest

It is well known that similarity effects visual search efficiency. Guest and Lamberts (2011) proposed a model to account for the time course of visual search that assumes (unlike many models) that similarity between objects and internal representations of objects is not static but changes as perceptual information is processed about objects and their features. This assumption underpins models of other perceptual tasks (e.g., categorization, Guest & Lamberts, 2011). Here we extend the model and show it can account for the time course of eye fixation data in simple feature search and conjunction search (Experiment 1). We also extend the model to account for performance in dual target search. The model accounts well for the impact of searching for two targets (Experiment 2a and 2b) and also captures set size effects (Experiment 3). Importantly, the model suggests that, at least some of the time, two targets can be searched for simultaneously.

OS3.TAR.4 PUPIL SIZE REFLECTS EXPLORATION AND EXPLOITATION IN VISUAL SEARCH (AND IT'S LIKE OBJECT-BASED ATTENTION)

Mathôt, S. & Regnath, F.

University of Groningen, Netherlands

Presenting author: Sebastiaan Mathôt

The adaptive-gain theory (AGT) distinguishes two modes of behavior: exploitation and exploration. During exploitation, you are focused on a single task; during exploration, you rapidly switch between tasks. The AGT further posits that exploration is associated with larger pupils than exploitation, and that large pupils reflect increased activity in the Locus Coeruleus (LC). Here we test these predictions in a visual-search task. Participants searched for a target in a display that was divided into regions of different colors. These regions were unrelated to the search task. Nevertheless, we found that participants tended to search one region at a time, reminiscent of object-based attention. Furthermore, we found that switches to another region were accompanied by pupil dilation. This suggests that shifting attention (or gaze) from one region towards another region is a form of “micro-exploration” that is accompanied by pupil dilation and, presumably, increased tonic activity of the LC.

Barcelona Room

Dyslexia

OS3.BAR.1 THE LINK BETWEEN COGNITIVE DISORDERS AND EMOTIONAL PROBLEMS: INSIGHTS FROM DEVELOPMENTAL DYSLEXIA

McArthur, G., Francis, D., Robidoux, S., Badcock, N., & Hudson, J.

Macquarie University

Presenting author: Genevieve McArthur

There is growing concern amongst educators, clinicians, and scientists that children with cognitive disorders are at increased risk for emotional problems. This concern is backed by scientific studies showing associations between childhood cognitive disorders and emotional problems. Unfortunately, our understanding of why these associations exist is limited. By combining the statistical power of large-scale longitudinal studies with the causal testing power of intervention case studies, we are working towards the first comprehensive evidence-based theory of the mechanisms linking one childhood cognitive disorder - developmental dyslexia - to emotional problems. In this presentation, I will present the outcomes of our most recent studies which are providing glimpses into these mechanisms. I will also consider how these mechanisms might explain associations between other cognitive disorders and emotional problems.

OS3.BAR.2 WEAKER NEURAL RESPONSES TO LEXICALITY AND WORD FREQUENCY IN DYSLEXIC ADULTS: AN EEG STUDY WITH FAST PERIODIC VISUAL STIMULATION

Lochy, A.¹, Collette, E.², Rossion, B.^{2,3}, Schelstraete, M.-A.², & Schiltz, C.¹

1 Université du Luxembourg, Luxembourg; 2 Université Catholique de Louvain, Belgium; 3 Université de Lorraine, France

Presenting author: Aliette Lochy

Dyslexia, a persistent reading disorder, is characterized by different brain activation patterns when reading. Here, we used a Fast Periodic Visual Stimulation paradigm during EEG recordings to assess the sensitivity of dyslexics to fine-grained psycholinguistic variations of letter strings: lexicality, lexical frequency, and orthographic regularity. Dyslexic

and non-dyslexic students watched 60-seconds streams of stimuli presented at 10Hz, in which deviant items are inserted periodically (1/8, at 1.25Hz). Results show discrimination responses at 1.25Hz over left posterior occipito-temporal regions, reduced in dyslexics. Group differences were significant for discrimination of word lexicality and frequency, but not for word regularity. These results show that FPVS response amplitude distinguishes normal from pathological population. Since explicit reading is prohibited by the fast rate, results suggest differences of automatic and implicit word processing in dyslexics. The lack of group difference for regular/irregular words is interpreted post-hoc as reflecting the life-long drill of dyslexics to irregular words.

OS3.BAR.3 DEVELOPMENTAL DYSLEXIA: A DEFICIT IN MAGNOCELLULAR-PARVOCELLULAR CO-ACTIVATION, NOT SIMPLY IN PURE MAGNOCELLULAR ACTIVATION

Ciavarelli, A. & Casco, C.

University of Padova, Padova, Italy

Presenting author: Giulio Contemori

High contrast sensitivity (CS) with Gabor stimuli of very low spatial frequency (SF) and very high temporal frequency (TF) indicates pure magnocellular sensitivity. Any advantage in CS, by either decreasing TF or using static high-SF Gabors, would be ascribed to the coexisting responses of both systems. Differently from the prediction of the magnocellular deficit, in our study dyslexic individuals showed no deficit in the unmixed magnocellular response. Also, differently from controls, they showed no advantage when the relative weight between magnocellular and parvocellular inputs was thrown off balance in favor of the latter. Our results point out that in dyslexia, the relative contribution of these two systems to visual processing is perturbed and this may have a detrimental consequence in word processing, both within the parafovea and the fovea, during fixation. Collectively, these data may give a contribution to the advancement of diagnostic and training protocols for developmental dyslexia.

OS3.BAR.4 DOES A SOCIO-EVALUATIVE CONTEXT MODULATE THE AMPLITUDE OF THE PHONOLOGICAL DEFICIT IN DEVELOPMENTAL DYSLEXIA?

Maïonchi-Pino, N.¹, Magnien, A.², Chabanal, D.¹, Lucas, O.¹, Ferrand, L.¹, & Huguet, P.¹

1 Clermont Auvergne Université, FR; 2 Université de Franche-Comté, FR

Presenting author: Norbert Maïonchi-Pino

Cross-linguistic studies suggest that phonological deficit tends to be a universal marker of reading difficulties in developmental dyslexia (DD). However, there is a debate between the degraded phonological representation hypothesis and the hypothesis that the phonological deficit stems from difficulties in memorizing, accessing and retrieving the phonological representations. Our aim was to determine to what extent a socio-evaluative context modulates the amplitude and the expression of this phonological deficit. We designed tasks that involved the use of phonological syllables in silent reading by jointly manipulating the evaluative pressure of the instructions to saturate the phonological loop of the working memory (known to be impaired in DD). Our results showed that stressful instructions given on the importance to succeed in a reading task impact negatively both the performance and the phonological response patterns of children with DD, more than typically-developing children, suggesting failure to access phonological syllable-based representations under socio-evaluative contexts.

Palma de Mallorca Room

Arithmetics II

OS3.PAL.1 SPATIAL BIASES IN MENTAL ARITHMETIC ARE INDEPENDENT OF READING HABITS: EVIDENCE FROM FRENCH AND ARABIC SPEAKERS

Masson, N., Andres, M., Alsamour, M., Bollen, Z., & Pesenti, M.

Université catholique de Louvain (UCLouvain), Belgium

Presenting author: Nicolas Masson

The representation of number magnitude appears linked to space, with small- vs. large-magnitude numbers being respectively related to the left vs. right side of space in Western cultures. These Spatial-Numerical Associations (SNAs) in number processing is commonly attributed to the reading/writing direction. SNAs have also been reported in Western participants solving arithmetic problems, with subtraction/addition inducing leftward/rightward biases. Here, we tested whether SNAs in arithmetic stem from reading direction by using a temporal order judgement task in participants with opposing reading directions. French/Arabic speakers solved subtraction and addition problems while determining which of a left or right target appeared first on screen. Both groups favoured the right target more often when solving addition than when solving subtraction problems. These results indicate that SNAs in arithmetic are not related to reading direction. We call for a reconsideration of current models and suggest a pervasive role of biological factors in human adults.

OS3.PAL.2 THE MALLEABILITY OF NUMBER

Reynvoet, B. & Ariens, S.

KU Leuven, Belgium

Presenting author: Bert Reynvoet

Numerosity comparison, i.e. deciding which dot-array contains the most dots, has attracted a lot of interest in the numerical cognition field. However, the interplay between number and non-numerical cues of the dot-arrays (total area, convex hull,...) in numerosity decisions remain unclear. The contribution of number and non-numerical cues in numerosity decisions has been demonstrated with congruency effects: congruent trials (where number and non-numerical cues correlate) are easier than incongruent trials

(where number and non-numerical cues anti-correlate). In the present study, we manipulated the list of to be presented trials and observed a reduced congruency effect when the list also contained filler trials with some of the non-numerical cues correlating positively and others negatively with number (partial congruent trials). This pattern shows that changing the relation amongst the different non-numerical cues, results in different numerosity decisions. Implications for theories on numerosity processing will be discussed.

OS3.PAL.3 INITIAL COMPETENCE AND EXPERIENCE-DRIVEN REFINEMENT OF NUMERICAL ACUITY IN DEEP NEURAL NETWORKS

Testolin, A.¹, Zou, Y.², & McClelland, J.³

1 University of Padova, IT; 2 Stanford University, USA

Presenting author: Alberto Testolin

Newborns are sensitive to the approximate number of items in a visual display, however numerical acuity improves during development and is higher in adults with more extensive formal education. Our computational model shows that a deep neural network can exhibit initial sensitivity to numerosity after random initialization, and experience-driven unsupervised learning leads to a progressive refinement of numerical representations, following a developmental trajectory similar in form to that seen in human subjects. Sensitivity to numerosity emerges both with controlled training stimuli, where number orthogonally varies with total area and number frequencies are uniformly distributed, but also using a more ecological set of training stimuli mirroring the statistical distribution of visual features in natural environments. Overall, our work combines with other recent behavioral and computational findings to support the emerging focus on the role of experience rather than evolutionary specialization as a major determinant of human numerosity judgement abilities.

OS3.PAL.4 EMOTION AFFECTS ARITHMETIC

Kulkova, E.S. & Fischer, M.H.

University of Potsdam, Germany

Presenting author: Elena Kulkova

Both mental arithmetic and emotions demonstrate spatial associations. However, it is unclear whether these associations are interconnected. Our study investigates whether emotional priming affects calculation performance. 30 adults saw blocks of happy, neutral or sad pictures followed after 1000 ms by multi-digit arithmetic facts until a verbal true-false response was recorded. Pictures represented either human emotional faces or landscapes,

animals and objects. Calculation was faster for additions than subtractions and for non-carry over carry- problems. Both happy and sad pictures facilitated additions compared with neutral pictures. Happy pictures also facilitated subtractions. Happy non-face pictures facilitated processing carry problems more than happy faces. The findings suggest that the spatial association of emotions is mediated by magnitude (less/more emotion) not valence, and that there is a general “positive bias”. Decoding human emotion may require more time and cognitive resources and, therefore, conflict with effortful carry problem solving, resulting in its inhibition.



Tenerife

25-28 September

POSTER PRESENTATIONS. ABSTRACTS

Poster session 1

Espejos Hall

Thursday 26th
11:40-13:10

PS1.1. REM VERSUS NON-REM SLEEP DISTURBANCE SPECIFICALLY AFFECTS INTER-SPECIFIC EMOTION PROCESSING IN FAMILY DOGS (CANIS FAMILIARIS)

Kis, A.¹, Bolló, H.¹, Kovács, K.¹, Lefter, R.², & Topál, J.¹

1 Institute of Cognitive Neuroscience and Psychology, Hungarian Academy of Sciences; 2 Alexandru Ioan Cuza University, Iasi, Romania

Dogs stand out in their capability to read human emotional expressions, both vocal and facial. We have previously shown that positively versus negatively valenced dog-human social interactions substantially affect dogs' sleep structure (measured via non-invasive polysomnography). In the present study we manipulated dogs' (N=15, within subject design) sleep structure by specifically disrupting REM versus Non-REM sleep while maintaining equal sleep efficiency. We found that both the number of awakenings as well as relative Non-REM (but not relative REM) duration influenced dogs' viewing patterns in a task where sad and happy human faces were simultaneously projected with sad or happy human voice playback. In accordance with the emotion laterality hypothesis, the interaction between sound valence and Non-REM sleep duration was specific to images projected to the left (regardless of image-sound congruency). We show for the first time a causal link between sleep structure and inter-specific emotion-processing in the family dog.

PS1.2. THE GOOD, THE BAD, AND THE UNEXPECTED: FACTORS AFFECTING THE VALENCE OF UNEXPECTED EVENTS REPORTED FOR EVERYDAY SCENARIOS

Quinn, M.S., Campbell, K., & Keane, M.T.
University College Dublin (UCD)

Though most of us probably worry about unexpectedly bad things happening to us, we sometimes daydream about unexpectedly good things happening, too. These opposing possibilities reflect the inherent ambiguity that arises when we consider what unexpected things may occur next. Researchers do not often ask what "the unexpected" truly

means to their participants. In the present study, participants were presented with everyday scenarios and asked to think of unexpected next events. Results showed that the unexpected may include a flipping of the valence of the scenario (i.e. negative events are more often reported as unexpected next events when the scenario is mainly positive). We discuss implications of this flipping effect on research of the unexpected as well as potential applications.

PS1.3. TWO L1-S OR TWO L2-S? THE CONSEQUENCES OF L2 IMMERSION FOR LEXICAL ACCESS AND CROSS-LANGUAGE INTERFERENCE IN BILINGUALS

Durlik, J.¹, Bajo, M.T.², & Wodniecka, Z.¹

1 Jagiellonian University, Poland; 2 University of Granada, Spain

In the study we tested two groups of Polish-English bilinguals: immersed (living in UK) and non-immersed (living in Poland). Two groups demonstrated comparable L1 and L2 general proficiency (LexTALE-s), but differed in lexical access in production (picture naming, verbal fluency): immersed-group performed similar in both languages, whereas non-immersed scored higher in L1 than L2. This suggests that immersed group had balanced lexical access in both languages, related to the immersion experience rather than general language proficiency. Additionally, the immersed outperformed non-immersed in L2 and underperformed in L1. In interference tasks with cross-language homographs, immersed-group showed similar strength of interference in both directions, whereas non-immersed experienced much stronger L1->L2 than L2->L1 interference. We also observed stronger L2->L1 and weaker L1->L2 interference in immersed-group than in non-immersed one. Overall, L2-immersion seems to lead to balanced activation across languages but limited L1 access when compared to native language surroundings.

PS1.4. NEURONAL ACTIVITY IN A MENTAL ROTATION TASK WITH ABSTRACT AND HUMAN BODIES AS STIMULI

Jansen, P., Render, A., & Scheer, C.

University of Regensburg, Germany

The main goal of the study is to assess whether the performance and the neuronal activity in a mental rotation task with abstract and embodied figures differs between males and females. 27 females and 32 males completed a chronometric mental rotation task with cube figures, human figures and body postures. Participants had - dependent on angular disparity - a faster reaction time and a higher accuracy rate for embodied stimuli compared to cube figures. This result was in accordance with the data of the neuronal activity in the parietal cortex. Determined by angular disparity, neuronal activity was higher for the cube figures than for the human stimuli assuming a higher effort to solve the task. There were no sex differences in the behavioral data and only small differences in the ERP measurement. Thus, the (non-) existence of sex differences in chronometric mental rotation tasks is far from being understood.

PS1.5. CHANGES IN TONIC PUPIL SIZE REFLECT FLUCTUATIONS IN TASK ATTENTIONAL ENGAGEMENT DURING AUDITORY SUSTAINED ATTENTION TASK

Dankner, Y., Yuval-Greenberg, S., & Shalev, L.

Tel-Aviv University, Israel

During a continuous task, the attentional state often shifts between two modes: on-task, characterized by high level of attention and task engagement, and off-task, characterized by distractibility and task disengagement that leads to inconsistent performance, i.e. high variability of reaction times (RTs). The current study examined whether the level of attentional engagement is reflected in tonic pupil size (TPS) during auditory sustained attention task. Participants performed an auditory continuous performance task while their pupil size was recorded. Results showed that in trials where the TPS was smaller performance was more consistent than in trials where it was larger. Results also discovered that participants' average TPS correlated with their overall behavioral performance in the task- smaller TPS was linked to better performance. Our findings suggest that TPS reflects intra-individual changes in task engagement and also individual differences in the ability to sustain attention over time.

PS1.6. INDUCING A FALSE INSIGHT USING REPORTABLE AND UNREPORTABLE SEMANTIC HINTS

Ammalainen, A.V.¹ & Moroshkina, N.V.²

1 Saint Petersburg State University, Russia; 2 Saint Petersburg State University, Russia

It was previously shown that presenting an unreportable hint decreases the time of solving anagram (Bowden, 1997). Moreover, participants' Aha!-experience is higher for solution-relevant hints than for unrelated ones. We suggested that it should be possible to induce wrong solutions using false hints and Aha!-ratings for these solutions would be lower. In the experiment, participants solved anagrams which had one correct solution and one shorter word inside them. After ten seconds of an attempt, the picture hint was presented for 1 or 60 frames. The picture prompted either the correct answer or the wrong. Results showed that participants more often used shorter words as solutions (intrusion errors) after seeing reportable false hints but not unreportable. At the same time, the Aha!-experience ratings were lower for intrusion errors than for correct solutions which is consistent with our hypotheses. The reported study was funded by RFBR according to the research project № 18-00-00646 K (18-00-00644)"

PS1.7. STATISTICAL LEARNING OF ADJACENT AND NON-ADJACENT PAIRS IN NON-LINGUISTIC SHORT SEQUENCES

Lazartigues, L.¹, Rey, A.², Fagot, J.², Mathy, F.¹, & Lavigne, F.¹

1 Université Côte D'azur, CNRS, BCL, Nice, France; 2 CNRS & Aix-Marseille Université, Marseille, France

The ability to learn adjacent and non-adjacent pairs is central in language processing. However, current evidence indicates that adjacent and non-adjacent pairs are not equally learnable. The present study investigated the role of transitional probabilities during the learning of adjacent and non-adjacent pairs appearing in non-linguistic short sequences. Participants were exposed to four sequences of three stimuli ABC repeated randomly during the experiment, with each stimulus corresponding to a given position of a red dot on a touchscreen. In the first experiment the transition BC of the triplet ABC was fully predictable while the first transition AB was unpredictable. The second experiment required the learning of the fully predictable non-adjacent pair AC while the transitions AB and BC were unpredictable. The results showed that participants learned adjacent pairs and had greater difficulty to learn the non-adjacent pairs. These data provide additional constraints for modeling statistical learning mechanisms.

PS1.8. ILLUSTRATOR STYLE AND COGNITIVE PROCESSING OF COMICS: A STUDY USING EYETRACKING AND DEEP CONVOLUTIONAL NEURAL NETWORK MODELING

Laubrock, J. & Dubray, D.

University of Potsdam, Germany

Comics are a cultural artefact with underexplored potential for cognitive psychology, as they combine aspects of scene perception, text comprehension, and narrative understanding. The perceived lack of objective describability of such complex stimuli might be responsible for the relative scarcity of studies. Here we present an analysis of a large comics corpus of about 50,000 pages in terms of features of a deep convolutional neural network (DCNN), which provides such an objective description. DCNNs can be regarded as highly abstract models of hierarchical processing in the ventral visual stream. We use a sparse DCNN-based signature to classify illustrator style with high accuracy. A lesion experiment shows that mid-level vision features are most discriminative. In an applied perception study we show that DCNN features can be used for semantic image segmentation, e.g., to segment speech balloons. Finally, we use DCNN features to quite successfully model the distribution of readers' gaze fixations.

PS1.9. PREFRONTAL ACTIVITY DURING ITEM-SPECIFIC CONTROL OF ATTENTION: AN FNIRS STUDY

Atalay, N.B.¹, Türkoğlu, S.², Çakır, P.³, & Erdeniz, B.²

1 TOBB University of Economics and Technology, Turkey; 2 İzmir University of Economics, Turkey; 3 Middle East Technical University, Turkey

Dynamic control of attentional selection is often investigated with item-specific proportion congruence (ISPC) effect, a smaller congruency effect for mostly incongruent items compared to mostly congruent items. In previous studies, we showed that stimulus onset asynchrony (SOA) between relevant and irrelevant dimensions of the Flanker stimulus influences the ISPC effect. The ISPC effect is larger when the flankers are presented before the target letter, compared to when they are presented simultaneously, but it disappeared when the target letter is presented before the flankers. Using multichannel functional near-infrared spectroscopy (fNIRS), we examined hemodynamic activity of the prefrontal cortex of healthy volunteers (N = 41) during the ISPC task. Results showed smaller hemoglobin changes when the target letter is presented before the flanker letters, compared to the other SOA conditions. Hemodynamic responses in the prefrontal cortex are modulated with the SOA between the target and flanker letters in the ISPC task.

PS1.10. INTERACTIVE MOTOR ACTIVITIES INFLUENCE PERSPECTIVE ADOPTION IN ACTION-LANGUAGE UNDERSTANDING

Sato, M.¹, Niikuni, K.², Schafer, A.J.³, & Koizumi, M.⁴

1 Okinawa International University, Japan; 2 Tohoku University, Japan; 3 University of Hawaii, USA; 4 Tohoku University, Japan

Language-embodiment research consistently shows that first-/second-person pronouns or third-person pronouns make comprehenders take the agent's or the observer's perspective, respectively. However, in the absence of explicit cues, English users preferentially adopt agent perspectives (e.g., upon comprehending isolated action verbs), while Japanese users preferentially avoid particular perspectives (e.g., upon comprehending null-subject sentences). This psycholinguistic study uses Japanese null-subject sentences, which allow various agents. Employing a novel experimental method, it investigates whether different types of physical interaction affect comprehenders' perspective-taking and event representation when they interpret such sentences. Participants adopted the observer's perspective after engaging in any motor activity with another person, but no particular perspective if they had not engaged in activity with others. These findings suggest that the mind is tied to bodily and contextual information: the presence of others leads participants to identify an event's agent as another person, and situate themselves as observers.

PS1.11. FACE IN COLLISION: HOW EMOTIONAL LOOMING STIMULI INFLUENCE THE DEVELOPMENT OF PERIPERSONAL SPACE

Silvestri, V.¹, Grassi, M.², & Nava, E.¹

1 University of Milano-Bicocca (Milan, Italy); 2 University of Padova (Padova, Italy)

Our system constantly monitors the surrounding environment and its potential threats, particularly in the so-called 'peripersonal space'. In this study, by measuring the physiological response through skin conductance (SCR) and the reaction times (RT) to approaching stimuli, we investigated whether facial emotions in collision with subjects can shape the boundaries of peripersonal space in 25 children and 22 adults. We found overall higher arousal in children than adults, driven by male children, who presented higher SCR across emotions than female. Even though adults did not present any modulation in terms of SCR, they responded faster to angry than happy or neutral faces. Our findings suggest that emotions differently shape peripersonal space in children and adults: while in adults threatening stimuli consciously alter the boundaries of

peripersonal space, as indexed by faster RT, in children peripersonal space is only altered at an unconscious level, as indexed by SCR.

PS1.12. PARAFOVEAL-ON-FOVEAL REPETITION EFFECTS IN SENTENCE READING: A CO-REGISTERED EYE-TRACKING AND EEG STUDY

Mirault, J.¹, Broqua, F.¹, Dufau, S.^{1,2}, Holcomb, P.J.³, & Grainger, J.^{1,2}

1. Aix-Marseille University & CNRS, France; 2. Institute for Language, Communication, and the Brain, France; 3. San Diego State University, USA

When reading, can the next word in the sentence (word n+1) influence how you read the word you are currently looking at (word n)? Serial models of sentence reading state that this generally should not be the case, whereas parallel models predict that this should be the case. Here we focus on perhaps the simplest and the strongest parafoveal-on-foveal (PoF) manipulation: word n +1 is either the same as word n or a different word. Participants read sentences for comprehension, and when their eyes left word n, the repeated or unrelated word at position n +1 were swapped for a word that provided a syntactically correct continuation of the sentence. We recorded EEG and eye-movements, and time-locked the analysis of fixation-related-potentials (FRPs) to fixation of word n. We found robust PoF repetition effects on gaze durations on word n. Most important is that we also observed significant effects in FRPs, reaching a conservative estimate of significance in a time-window spanning 250-400 ms post-fixation of word n. These effects were marginally significant (after correction) in an earlier 120-250 ms time window and continued into the 400-550 ms time-window. Repetition of the target word n at position n+1 caused a reduced negativity in the FRPs. Given the timing of this effect we argue that it is driven by orthographic processing of word n+1 while readers' eyes are still fixating word n.

PS1.13. THE ROLE OF SEMANTIC (IN)CONGRUENCY IN ADOLESCENTS' EPISODIC MEMORY

Andrade, M.Â. & Raposo, A.

Universidade de Lisboa, Portugal

Episodic memory presents different developmental trajectories, with familiarity maturing during childhood and recollection continuing to develop during adolescence. Previous work has shown that recollection promotes the strategic retrieval of contextual details about past events, especially when item-context associations are arbitrary and cannot rely on semantic knowledge. To investigate how

semantic congruency impacts episodic memory in adolescence, we compared performance of adolescents (n=35, age range=13-16) and adults (n=38, age range=24-27) in a recognition memory task. Participants judged whether item-context pairs were congruent or not. Subsequently, item and context memory were tested. Adolescents were less accurate in item memory than adults and this effect was greater during retrieval of incongruent objects. For context memory, adolescents had lower performance only when retrieving incongruent contexts. These data demonstrate the important role of semantic congruency in episodic memory development and how congruent and incongruent events may differentially rely on familiarity and recollection processes.

PS1.14. DOES CREATIVITY INFLUENCE PERCEPTION? - INVESTIGATING THE EFFECT OF CREATIVITY ON PERCEPTION WITH EVENT-RELATED POTENTIALS

Csizmadia, P., Czigler, I., Nagy, B., Kojouharova, P., Petró, P., & Gaál, Z.A.

Hungarian Academy of Sciences, Hungary

In an active visual oddball paradigm we studied whether there is a difference in the perception of creative and non-creative people, and how it changes with age. 30 young (18-30 years) and 30 older (60-75 years) adults were divided into creative and less creative groups according to a visual creativity test. Two types of standard stimuli were presented – unambiguous and ambiguous portrait paintings. Deviants were pictures of butterflies. In both age groups creative participants had greater P3 amplitude in standard trials than less creative people. Amongst creative participants differential processing of ambiguous standards were more pronounced in the 550 – 680 ms intervals in the older group and in the 540 – 585 ms intervals in the younger group at Cz and Pz electrodes, indicating that creativity can influence visual stimulus processing and it has more effect in older adults.

PS1.15. INHIBITORY CONTROL HINDERS THE REWIRING OF HABIT-LIKE PROCEDURAL KNOWLEDGE

Guttenger, A.¹, Horváth, K.^{1,2}, Solymosi, P.¹, Gergely, Á.¹, Mikó, K.¹, Németh, D.^{1,2,3}, & Janacsek, K.^{1,2}

1 Eötvös Loránd University (ELTE), Hungary; 2 Hungarian Academy of Sciences (HAS), Hungary; 3 Lyon Neuroscience Research Center (CRNL), Université de Lyon, France"

Procedural learning underlies habit-like behaviours. Behaviour change ('rewiring') may involve unlearning old associations while developing new ones. It is still unclear whether old knowledge can be 'erased' or only

intentionally inhibited. We tested unlearning of old associations and acquiring new ones, along with the role of inhibitory control during rewiring. Thirty-two young adults completed a procedural learning task in three days. In the Learning Phase, participants learned 'A' associations. In the Rewiring Phase, the original knowledge was rewired with partly overlapping 'B' associations. This rewiring task was combined with the Go/No-go paradigm: certain automatic responses had to be inhibited. The Testing Phase consisted of testing both 'A' and 'B' associations. Participants successfully acquired new associations, but the inhibition of automatic responses weakened this process. Old knowledge could not be unlearned; moreover, response inhibition further strengthened it. Our findings highlight the detrimental effect of inhibitory control in rewiring of habit-like behaviours.

PS1.16. DYNAMIC AND ADAPTIVE PROACTIVE PERCEPTUAL TEMPLATES ARE WEIGHTED BY RELEVANT FEATURE DIMENSIONS

Boettcher, S.E.P., van Ede, F. & Nobre, A.C.
University of Oxford, UK

Proactive memory-based templates play a critical role in perception. We show that these perceptual templates are dynamic and adaptive to the context. Participants learned association between four shapes and four colored gratings. Gratings each had a unique combination of color (green or pink) and orientation (left or right tilt). On each trial, observers saw one shape followed by one grating and indicated whether or not the pair matched the learned shape-grating association. We manipulated the probability of the non-match stimuli. In some blocks the non-matching stimuli were most likely to differ in color but not orientation, while in other blocks this was reversed. We find that participants are more likely to false alarm and slower to respond to unexpected non-match stimuli, indicating that the template for the upcoming stimulus can be dynamically adapted such that the distinguishing feature-dimension dominates the template.

PS1.17. L2 MEMORY IS LESS SENSITIVE TO DISFLUENCIES IN LINGUISTIC INPUT THAN L1 MEMORY

Konopka, A. & Saha, L.
University of Aberdeen

Listeners show better memory for words occurring after disfluencies ("the uh... cup") than for the same words in fluent sentences ("the cup"). This study tested whether a disfluency-mediated memory benefit is present in both native

(L1) and non-native (L2) listeners using a change detection paradigm. L1 and L2 participants studied pictures of transitive events accompanied by fluent recordings ("The lightning struck the church"), or recordings with agent name errors ("The storm... no, the lightning...") or patient name errors ("...the house... no, the church."). At test, participants made old/new recognition judgments for pictures showing the original patient characters (the studied church) or modified patient characters (a different-color church). Recognition memory performance (d') showed a disfluency-mediated benefit in L1 listeners. In contrast, L2 listeners showed consistently high recognition memory performance across all conditions (i.e., irrespective of disfluency), suggesting that L1 and L2 memory are sensitive to different surface features of linguistic input.

PS1.18. FROM WHOM DO WE LEARN? EFFECTS OF THE CONVERSATION PARTNER'S ACCENT ON INCIDENTAL L2 WORD LEARNING IN DIALOGUE

Lemhöfer, K.
Radboud University, The Netherlands

In two studies, we investigated the role of a conversation partner's accent on incidental L2 word learning in dialogue. In study 1, 69 Dutch speakers of L2 English interacted with a 'virtual partner' (audio recordings) who either had the same (Dutch) or a different non-native accent (German) as the participant, or a native (British) accent. Participants and their 'partners' alternately made price judgments on pairs of displayed objects. This way, participants were first exposed to previously unknown object names before being required to produce them themselves. No significant effect of speaker accent on learning rates was found. Apparently, any input is equally used to fill vocabulary gaps in an L2. Following up on this, using the same experimental method, we are currently conducting study 2. Here, we assess learners' willingness to overwrite existing L2 (American English) vocabulary by alternative (British English) object labels used by dialogue partners with different accents.

PS1.19. CONTEXTUAL PRIMING IN SHADOWING AND SIMULTANEOUS TRANSLATION

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1 Max Planck Institute for Psycholinguistics, Nijmegen, The Netherlands; 2 Radboud University, Nijmegen, The Netherlands

In two experiments, participants either shadowed or simultaneously translated short narratives (Experiment 1) or word lists (Experiment 2), presented at different speeds. Differences in the resulting task performance showed that

context was far more important for translation than shadowing, especially at higher speech rate. To understand how context facilitates, we used a comparison of mixed effects models to determine the effects of phonological, semantic, and syntactic context in both source and target language on response latency. A novel dataset of n-gram frequencies and distributional semantic vectors based on a subtitle corpus allowed us to compute semantic similarities and transitional probabilities over word pairs and longer phrases. We used these measures to construct quantitative representations of context and demonstrate differences and commonalities between the largely phonologically mediated shadowing task, and the more conceptual-semantically mediated interpreting task.

PS1.20. DOMAIN GENERAL STATISTICAL LEARNING IMPAIRMENT IN DYSLEXIA: SENSITIVITY OF ONLINE AND OFFLINE MEASURES ACROSS MODALITIES AND DOMAINS

Lukács, Á.^{1,2}, Dobó, D.^{1,2}, Németh, K.¹, Szöllősi, Á.^{1,3}, & Lukics, K.S.^{1,2}

1 Budapest University of Technology and Economics, Hungary; 2 MTA-BME Lendület Language Acquisition Research Group, Budapest, Hungary; 3 Hungarian Academy of Sciences, Hungary

We explored statistical learning in adolescents with and without developmental dyslexia (DD and TD; n=19 in both groups, matched on age, sex and IQ at the group level) in acoustic verbal and visual nonverbal segmentation in online target detection tasks, measuring learning with the differences between reaction times (RT) to predictable versus unpredictable targets. Explicit judgments of well-formedness were also elicited. Significant online learning was observed in both groups in both domains, but participants with dyslexia showed a smaller learning effect and slower learning of statistical regularities. On the explicit measures, the DD group was at chance in the visual, but not the verbal domain. These findings suggest that the SL impairment in dyslexia is present across modalities and domains. Results also imply that explicit measures may mask learning abilities, and measuring learning online can provide more sensitive indices that offer a deeper understanding of the deficit.

PS1.21. SPONTANEOUS PERCEPTION OF NUMEROSITY IN PRE-SCHOOLERS

Anobile, G.¹, Guerrini, G.³, Burr, D.C.^{2,3}, Monti, M.³, Del Lucchese, B.¹ & Cicchini, G.M.²

1. IRCCS Stella Maris Foundation, Italy; 2. National Research Council, Italy; 3. University of Florence, Italy

There is strong evidence that very young humans can process numerosity. However, as numerosity naturally correlates with many non-numerical magnitudes, the idea of a direct number-sense has been strongly criticised. Here we applied two different psychophysical paradigms to demonstrate the spontaneous perception of numerosity in a cohort of young pre-school children. The results of both tasks showed that even at such an early developmental stage humans spontaneously base perceptual choices on numerosity, rather than area or density. Sensory precision in one of these numerosity tasks correlated well with math abilities in these young children. These results reinforce strongly the idea of a primary number-sense, and provide further evidence linking mathematical skills to the sensory precision of the spontaneous number-sense, rather than mechanisms involved in handling explicit numerosity judgements or extensive exposure to mathematical teaching.

PS1.22. MODELLING SEMANTICS BY INTEGRATING LINGUISTIC, VISUAL AND AFFECTIVE INFORMATION

Rotaru, A. & Vigliocco, G.

University College London (UCL), UK

A number of recent models of semantics combine linguistic information, derived from text corpora, and visual information, derived from image collections, demonstrating that the resulting multimodal models are better than either of their unimodal counterparts, in accounting for behavioural data. However, first, while linguistic models have been extensively tested for their fit to behavioural semantic ratings, this is not the case for visual models which are also far more limited in their coverage. More broadly, empirical work on semantic processing has shown that emotion also plays an important role especially for abstract concepts, however, models integrating emotion along with linguistic and visual information are lacking. Here, we first improve on visual representations by choosing a visual model that best fit semantic data and extending its coverage. Crucially then, we assess whether adding affective representations (obtained from a neural network model designed to predict emojis from co-occurring text) improves model's ability to fit semantic similarity/relatedness judgements from a purely linguistic and linguistic-visual model. We find that adding both visual and affective representations improve performance, with visual

representations providing an improvement especially for more concrete words and affective representations improving especially fit for more abstract words.

PS1.23. INTERACTIONS BETWEEN SIMULTANEOUS AEROBIC EXERCISE AND MENTAL ROTATION

Jost, L.¹, Weishäupl, A.^{1,2}, & Jansen, P.¹

1 Universität Regensburg, Germany; 2 Universität Passau, Germany

While effects of acute aerobic exercise on cognitive performance have been extensively studied, the opposite direction has not yet been investigated and is the main goal of this study. Forty-one German sport students cycled at 60% of maximal intensity while simultaneously performing mental rotation. Both physical and cognitive performances were compared with isolated cycling and mental rotation as control conditions using both objective (heart rate, pedal cadence, reaction time and accuracy) and subjective (RPE) measures. Results analyzed with hierarchical linear modeling revealed that heart rate and subjective effort while performing mental rotation were similar, despite pedal cadence being lower and more stable in time. Mental rotation performance showed no differences but subjective effort was higher during exercise. Our findings suggest that increased effort, both physiological and cognitive, is required during combined physical and cognitive work. This has important implications for the practical applications of learning or working while exercising.

PS1.24. EXPLORING THE RELATIONSHIP BETWEEN SPEECH-BRAIN ENTRAINMENT AND LANGUAGE DEVELOPMENT IN CHILDREN AT RISK OF DEVELOPMENTAL LANGUAGE DISORDER.

Pérez-Navarro, J., Molinaro, N., Carreiras, M. & Lallier, M.
Basque Center on Cognition, Brain and Language (BCBL), Spain

Phonology is a core domain in language acquisition and plays a major role on the development of other fundamental linguistic domains such as vocabulary and morphology. It is well established that phonological deficits are present in children with developmental dyslexia and developmental language disorder (DLD). The synchronization of neural oscillatory activity to speech (known as speech-brain entrainment) has been put forward as a potential neurophysiological mechanism for phonological skills. Such mechanism allows neural oscillatory activity to track the relevant linguistic features that are present in a continuous speech stream and parse them into meaningful units for a proper language processing. In the present experiment, we

explore the relation between speech-brain entrainment and phonological skills in children at risk of DLD and their age-matched typical-language-developing peers. In addition, we study the link between such neural entrainment to speech and the degree of development of vocabulary and morphology.

PS1.25. REVISITING INTERSUBJECTIVE ACTION-EFFECT BINDING: NO EVIDENCE FOR SOCIAL MODERATORS

Riechelmann, E., Weller, L., Huestegge, L., Böckler, A. & Pfister, R.

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Effect-based accounts of human action control have recently highlighted the possibility of representing one's own actions in terms of anticipated changes in the behavior of social interaction partners. In contrast to action effects that pertain to the agent's body or the agent's physical environment, social action effects have been proposed to come with peculiarities inherent to their social nature. Here, we revisit the currently most prominent demonstration of such a peculiarity: the role of eye contact for action-effect learning in social contexts (Sato & Itakura, 2013). In contrast to the previous demonstration of action-effect learning, a conceptual and a direct replication both yielded evidence for the absence of action-effect learning in the proposed design, irrespective of eye contact. Bayesian statistics supported this claim by demonstrating evidence in favor of the null hypothesis of no effect. These results suggest a limited generalizability of the original findings—for example, due to limitations that are inherent in the proposed study design or due to cultural differences.

PS1.26. READING COMPREHENSION AND SOCIOEMOTIONAL COMPETENCES IN CHILDREN WITH LEARNING DIFFICULTIES

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The present study evaluated the relationship between reading comprehension skills and socioemotional competences in children with specific learning difficulties (SLD) and typically developing children (TDC). A total sample of 115 primary school children from third to sixth grade answered the Reading Comprehension Test and Production of Texts (CL-PT), as well as the System of Evaluation of children and adolescents (SENA). Results indicated significant differences in reading comprehension, with a better performance in TDC. Regarding the socio-emotional competences, greater indicators of internal and contextual problems in SLD students were found. When correlating reading comprehension and social-emotional skills, significant

inverse correlations were observed in TDC only. The results agree with studies suggesting that the psychological well-being due to the develop of socio-emotional competences allows to better learning outcomes.

PS1.27. TASK CONFLICT TRIGGERS CONTROL ADJUSTMENTS AND TASK AVOIDANCE: EVIDENCE FROM TWO TASK-SWITCHING PARADIGMS

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Schuch, Dignath, Steinhauser, & Janczyk (2019) proposed an integrative theoretical perspective of conflict-triggered control adjustments in task switching and dual tasking. Several sequential effects can be viewed as instances of conflict-control loops under this perspective, facilitating flexible trial-by-trial adjustment of cognitive control. Here we focus on two sequential effects in task switching: I) Increased cognitive control after task conflict, as evidenced by improved performance after task sequences of type ABA (high task conflict due to persisting inhibition of task A) than after CBA (low task conflict, less persisting inhibition). II) Task avoidance after task conflict, as evidenced by an increased tendency to switch away from task A after ABA than after CBA in a voluntary task-switching paradigm. Evidence for both sequential effects will be presented, and their relationship to the theoretical framework will be illustrated.

PS1.28. DOES MINDFULNESS MEDITATION DIFFERENTIALLY MODULATE ASPECTS OF ATTENTIONAL CONTROL?

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Growing evidence suggests that mindfulness meditation (MM) may enhance cognitive performance by improving attentional control. With attention being a broad and complex construct, it is unclear which aspects of it are modulated by MM, if any. 96 participants naïve to MM were tested on two attentional tasks: visual search assessing fast orienting, and continuous performance assessing sustained attention. Questionnaires measured participants' state and trait mindfulness and productivity. In the following month, 32 participants practiced MM, 32 participants practiced progressive muscle relaxation (PMR), both administered through an App, and 32 participants did none of those things (passive control). Self reported mindfulness and productivity increased for the MM and PMR group but not the passive control. There were no significant group differences in the attentional tasks. While participants

reported being more mindful after one month of MM (and PMR!) this time seems not enough to improve the two measured aspects of attention.

PS1.29. ATTENTION IN POST-LEXICAL PROCESSES OF LANGUAGE PRODUCTION

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It has been claimed that lexical levels of language production require attention. Only recently, a few studies suggest post-lexical encoding processes are not automatic and also involve attention. Moreover, the degree of automaticity of the tasks and the type of attentional resources investigated possibly play a role on this issue. We proposed to young adults 4 dual-task studies including a verbal and a non-verbal task, varying the type of language processing (lexical / non-lexical), the degree of automaticity (less/more automatic) and the type of secondary task (processing speed / inhibition). A significant dual-task cost on speech performance is only observed for the less automatic lexical task. The secondary attentional task is systematically affected in dual-task condition, with increased impact on processing speed than on inhibition. Factors related to the language task as well as the demand of the concurrent task seem to determine attention requirements in language production.

PS1.30. SOCIOMOTOR ACTIONS: ANTICIPATED PARTNER RESPONSES ARE PRIMARILY REPRESENTED IN TERMS OF SPATIAL, NOT ANATOMICAL FEATURES

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People can represent their actions in terms of the behavior these actions evoke in others. In line with this idea, motor actions are facilitated if they are foreseeably imitated rather than counterimitated by another person. We investigated how another's behavior is represented in such being-imitated scenarios. The effect of being imitated can be explained by two distinct forms of compatibility between model and imitator actions: correspondence of anatomical features (imitative compatibility) and correspondence of spatial features (spatial compatibility). Research on motor priming suggests that spatial and anatomical features of other's actions are represented independently. We therefore investigated to which degree the benefit of anticipated imitation is caused by spatial or imitative compatibility. We found that spatial compatibility of an imitator's behavior did influence a model's actions, while imitative

compatibility did not. Actors thus represent actions of their social partners mainly in terms of non-social, spatial features.

PS1.31. TASK ENGAGEMENT INTERACTS WITH TEMPORAL PREPARATION: A COMBINED EXPERIMENTAL AND INDIVIDUAL-DIFFERENCES APPROACH

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When the interval (foreperiod, FP) between warning and imperative stimuli of a reaction time task varies unpredictably between trials, responses usually become faster with longer FPs. Here we examined in 80 participants whether individuals reporting high motivational engagement before the task (assessed via the Dundee Stress State Questionnaire, DSSQ) show an enhanced effect of this kind of temporal preparation. Comparing the performance of participants reporting high vs. low level of pre-task engagement, we observed an interaction of level of engagement with the variable-FP effect and the sequential FP effect: both effects were significantly smaller in individuals with self-reported high engagement. These results indicate that high levels of task engagement counteract the detrimental effects of suboptimal preparedness at short FPs, rather than improving preparation per se, especially after preceding long-FP trials, supporting the notion of sequential FP effects arising from arousal decrease/refractoriness after a previous preparatory interval.

PS1.32. VISUOSPATIAL ATTENTION IN CONTEXTS OF ANTICIPATED REWARD

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Previous studies suggest that inhibitory performance may be negatively affected in conditions of anticipated reward, depending on subject states and exact context. However, these effects could also be explained in part by attention. This was addressed in our study that employed a visuospatial cueing paradigm where cues were predictive of a subsequent target to which a response was required. In one condition the target was neutral, in two other conditions the target was reward related (money / food). Based on the overlap between disengagement of attention and inhibition, we expected that disengagement would be

negatively affected in reward contexts depending on the subject state (i.e. stress / BMI). In contrast, disengagement of attention was facilitated in a reward context, predominantly for high BMI. It is plausible that the exact mechanism that drives disengagement/inhibitory control operates differently in the VSC task as opposed to a task that specifically assesses inhibitory control.

PS1.33. LANGUAGE COMPREHENSION IN THE SOCIAL BRAIN: ELECTROPHYSIOLOGICAL BRAIN SIGNALS OF SOCIAL PRESENCE EFFECTS DURING SYNTACTIC AND SEMANTIC SENTENCE PROCESSING

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The present study utilized event-related brain potentials (ERPs) to study whether syntactic and semantic language processing might be subject to social presence effects. In a sentence correctness task, participants encountered sentences with a semantic or syntactic anomaly, as well as correct sentences, either alone or in the mere presence of a confederate. We found that while social condition did not impact task performance, probably due to low levels of task difficulty, it did significantly affect processing, as indicated by brain responses. While social presence seemed to delay early components of syntactic processing (LAN), it did not affect later syntactic processing (P600). Social presence also enhanced the early semantic component (N400). A right anterior main “social presence effect” arose as well, regardless of sentence type, and neural source analyses highlighted the involvement of areas implicated in attention and executive functions. The present results indicate that the study of language processes would not be comprehensive without introducing the presence of another person in proximity to the participant.

PS1.34. IT IS TOO HUMANLIKE TO INCREASE MY APPETITE! DISPOSITION TO ANTHROPOMORPHIZE ANIMALS RELATES TO DECREASED MEAT CONSUMPTION THROUGH EMPATHIC CONCERN

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People who exclude meat from their diets are not only devoid of situational pressures to disengage morally and deny humanlike mental states to animals but also they may be dispositionally more inclined to ascribe human-like qualities to non-human animals than omnivores. The aim of this research was to test whether individual differences in

anthropomorphism are related to empathic connection with non-human animals and thus decreased meat consumption. In two studies (N = 588), we confirmed that decreased meat consumption was associated with both increased recognition of human features in animals and increased empathy toward animals. Most importantly, our data support the model in which anthropomorphism with regard to animals predicts empathy. Empathy, in turn, leads to increased consideration of animal harm in dietary choices regarding meat, which in the end decreases meat consumption.

PS1.35. TACTILE TO VISUAL NUMBER PRIMING IN SIGHTED BRAILLE READERS: BEHAVIORAL AND FMRI STUDIES.

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It is debatable whether the magnitude code in the Intra-Parietal Sulcus (IPS) is truly abstract (modality-independent), as postulated in the Triple Code Model. Here, using behavioral and fMRI priming techniques we investigated the coding of tactile Braille numbers. We tested a unique group of 25 sighted Braille readers, who underwent a 9-month general Braille-course and a 3-week Braille-number recognition course. The primes were either tactile Braille digits or visual number words. The targets were Arabic digits. Subjects performed a primed naming task. Behavior revealed a V-shape priming function for both tactile Braille and written words, with priming for primes of identical value only (e.g. "four" and "4") indicating that the observed priming was identity priming, and suggesting the participants' engagement in the direct grapheme-phoneme conversion. fMRI priming revealed a robust activation within the left IPS. IPS activation for tactile stimuli may thus reflect phonological code activation rather than semantic activation.

PS1.36. GAZE ELICITS NON-SOCIAL AND SOCIAL ATTENTIONAL ORIENTING

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Eye gaze interacts in a special way with the human attentional systems, as shown through a reversed congruency effect observed with these social stimuli in the context of a

Spatial Stroop paradigm. Our experiment replicated these differences between social (eye-gaze) and non-social stimuli (arrows) in an intra-block design, where the type of stimuli was manipulated on a trial by trial basis, to further explore sequential congruency effects within and between stimulus type. We found the expected sequential congruency effect for arrow-arrow and gaze-gaze repetitions, with larger reversed congruency effects after incongruent than congruent trials for gaze. The same pattern was observed for alternations (arrows-gaze and gaze-arrows). Considering previous findings of abolishment of conflict adaptation when alternating between conflict types across trials, our results show that two effects are present in the reversed congruency effect observed with gaze: a standard non-social Stroop/Simon effect and a rather social distraction effect.

PS1.37. MEASURING LISTENING EFFORT OF NORMAL HEARING ADULTS BY DUAL-TASKING IN A CONVERSATIONAL SITUATION

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This study investigated listening effort in a conversational situation wherein coherent text is spoken by two talkers alternately and heard information have to be remembered. Specifically, we measured whether spatial separation between talkers helps to improve short-term memory. The listening tasks were about family stories either presented centrally in front of participants or spatially separated (standard stereo constellation). Participants had to answer questions after each text. To examine listening effort we used a dual-task paradigm wherein performance on a secondary task served as a measure of the cognitive load imposed by the listening task. To this end, we used a visual reaction times task in which participants made judgements about numbers. This secondary task was measured under the two listening conditions. We calculated the dual-task costs and compared the performance in the two listening conditions. The dual-task costs might provide a valuable insight into listening effort in conversational situations.

PS1.38. ASSESSING PHONETIC AND PHONOLOGICAL WORKING MEMORY PRECISION

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Only few studies have investigated auditory-verbal working memory (WM) precision, which is the resolution at which verbal items are maintained in WM. The aim of this

study was to explore WM precision using a phonetic-phonological similarity gradient in a recognition task. Lists of non-words were presented auditorily. After each list, a probe non-word was presented, and participants had to decide whether or not that item had been in the list. At the phonetic level, we modified the onset of the initial phoneme of one of the memoranda to render it phonetically ambiguous. At the phonological level, probe items differed from the memoranda by close (/p/-/b/) or more distinct (/p/-/t/) phonological contrasts. We observed an influence of both phonetic and phonological contrasts, which furthermore interacted with the serial position of the memoranda. This study suggests that WM precision is influenced by the level of linguistic abstraction and by serial position.

PS1.39. SEMANTIC RELATEDNESS CORRECTS THE AGE-RELATED BINDING DEFICIT IN WORKING MEMORY AND EPISODIC MEMORY

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It is well-known that long-term episodic memory (EM), especially binding memory (e.g., remembering the pairing of lock – race), is relatively impaired in older age. We tested whether this deficit could be corrected by facilitating establishment of the bindings in working memory (WM) through adapting the semantic relatedness of studied pairs according to participants' ongoing performance (Experiments 1 and 2). We also examined whether the effect was evident for the long-term retention of pairs that were not tested in WM (Experiment 2). The results revealed matched binding memory in WM and EM between age groups. Most importantly, older adults required increased semantic strength between word pairs to achieve similar performance to that of younger adults, regardless of whether pairs were immediately tested during the WM task. These findings indicate that relying on their superior semantic memory can correct the commonly exhibited profound deficit in binding memory in older age.

PS1.40. VERBALIZATION OF PERCEPTUAL MEMORY DISRUPTS PERCEPTUAL CATEGORY LEARNING

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This study examined how verbalization of perceptual information disrupts perceptual category learning. Previous studies suggest verbalization of perceptual memory (e.g., face, voice) has a detrimental effect for subsequent

memory performance; however, few examined effects of verbalization on learning performance. Sixty-five participants were asked to categorize unfamiliar mushroom into two categories without having any verbal information such as category names. After half of all trials, participants in Verbalization condition were asked to describe features of a mushroom for 3 min, which was presented at the end. Those in Control condition engaged in a filler task for 3 min. Then, all participants completed the remaining trials. In Control condition, categorization accuracy was higher after the filler task than before. In Verbalization condition, there was no difference in the accuracy between before and after the task. These results suggest verbalization of perceptual memory have detrimental effect for perceptual category learning.

PS1.41. THE INFLUENCE OF COGNITIVE AND RELAXATION TRAINING ON EFFICIENCY OF PILOT'S BEHAVIOUR

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We verified whether cognitive training and relaxation techniques may be useful tools in military pilots training. Previous studies using both methods have shown that they may be useful in the process of maintaining cognitive skills. However, research on the influence of both methods on the efficiency of execution of flight profiles has not been conducted. Pilots were tested in three groups in the pilot study (N=42). Computer based tests were administered to assess attention and working memory (WM). Web based WM training platform and Schultz relaxation training were used. MiG – 29 aircraft simulator capable of generating G-loads tested the efficiency of pilot's behaviour. Eye-tracker was used for scanning patterns and attention distribution data gathering. During initial statistical analyses we saw a difference between comparison groups. Results show us that both trainings can possibly be used along other training options to further expand pilots' skills.

PS1.42. MODULATION OF THE EFFECT OF AGGRESSIVENESS ON PERFORMANCE MONITORING BY THE HEART RATE VARIABILITY

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Cognitive control, a set of executive functions ensuring behavior adaptations in an always changing environment, is known to be impaired in aggressive populations. However, little is known about the impact of emotion regulation abilities on this impairment. In this study, participants

performed a Simon task during which electroencephalographic (EEG) and electromyographic (EMG) activities were recorded. EEG signals were used to analyze the error-related negativity (ERN), a performance monitoring index. EMG signals were used both to detect partial-errors, a reactive inhibition index, and to extract the heart rate variability (HRV), an emotion regulation abilities index. Also, the Buss & Perry Aggression Questionnaire was used to assess aggressiveness. Results showed no behavioral differences between high and low aggressiveness. ERN amplitudes were decreased in high aggressiveness individuals, but only in the low HRV group. Our findings seems to indicate that higher emotions regulation abilities counterbalanced performance monitoring reduction in individuals with aggressiveness tendencies.

PS1.43. PHYSICAL-DISTINCTIVENESS IN THE SIMON GAME: A SPATIAL SEQUENCE RECALL TASK

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Simon game consists of four tiles associated with distinct colors, sounds and spatial positions where people have to reproduce the longest recall of spatial sequences. This game relies on working memory and possibly episodic memory. However, it remains to determine what drive the game. Students completed an adapted version in which the modality (visual, auditory, bimodal) and the distinctiveness (low or high) were manipulated. Spatial recall was the highest in the distinct bimodal condition (red, green, blue, yellow associated with specific tones) and the lowest in the visual low distinctiveness condition (4 grey squares associated with a white noise). The other conditions were in between these two extremes. These results suggest that the visual distinctiveness is important, but audio information also contributes to the task. These data may help to develop playful cognitive stimulation with various difficulty levels in aging as this population is characterized altered in pattern separation processes.

PS1.44. MODULATION OF IMPLICIT SEQUENCE LEARNING BY A TASK-IRRELEVANT AUDITORY TONE

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It is well known that in the oddball paradigm a task-irrelevant stimulus involuntarily captures our attention, eliciting distraction (deviance distraction). Several studies have

explored the role of deviance distraction in categorization tasks, Go/No-go tasks, but there is no research yet on its effects in other paradigms such as implicit sequence learning (ISL). ISL is acquired when participants localize a target presented in each trial on several locations, and unbeknownst to the participants, according to a regular sequence. In a series of 3 experiments, participants (N=120) performed a combination of an oddball and ISL task with just 80% of the trials presented according to a probabilistic training sequence and they eventually acquired implicit knowledge about it, being faster and more accurate throughout training during those trials. Moreover, sequential congruency effects (SCE) emerged only when a task-irrelevant standard tone preceded the target during learning acquisition, suggesting a transient engagement of cognitive control.

PS1.45. DOES SAYING A NEW WORD OUT LOUD HELP TO LEARN IT BETTER? DISENTANGLING THE EFFECTS OF PRODUCTION AND SPEAKER VARIABILITY ON WORD LEARNING

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Previous research on the effect of production on word learning is inconclusive. For example, Zamuner et al. (2016) found a facilitatory effect of production, whereas Leach and Samuel (2007) found a detrimental effect. Studies have not always accounted for the fact that production can be confounded with speaker variability; when producing a word, we unavoidably hear it by an additional speaker (ourselves). The current study disentangles the effects of production and variability. Participants learned new words, associating each one with an unfamiliar picture. On each trial, participants heard the word twice:¹ by the same speaker,² by different speakers, or³ by hearing it and producing it themselves. After training, participants chose between two pictures for each word. Accuracy, RT, and eye-movements to the target image were collected.

Comparing across the three training conditions allows us to evaluate the effects of production and variability both independently and jointly.

PS1.46. SUPERIOR PARIETAL LOBULE: A CRUCIAL ROLE IN SIMULTANEOUS PERCEPTION OF VISUAL SEPARABLE FEATURES

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A bilateral lesion of superior parietal lobule (SPL) leads to a simultanagnosia, an inability to simultaneously perceive multiple elements. We have previously shown that a patient maintained a reduced visuo-attentional field in visual search involving separable features stimuli, while pop-out search based on shape and shape / colour conjunction search were performed as fast as control subjects. Here, to understand this reduction we explored the patient's visual processing of multiple elements using crowding tasks with stimuli composed of separable features (letters) or not (color patches). We found that, unlike the controls, target identification of the patient remained at chance level even with large flankers spacing. Complementary conditions allowed us to distinguish between a localization deficit when stimuli were colour patches and an inability to process multiple elements simultaneously specific to letters. SPL plays a crucial role in simultaneous processing of separable features which can explain its association with reading deficits.

PS1.47. ANTICIPATORY MECHANISMS AT BETA FREQUENCY IN LANGUAGE COMPREHENSION AND PRODUCTION

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Psycholinguistic literature has associated predictions during language comprehension and preparatory stages in production to suppression in the beta (~13-30 Hz) and alpha (~8-12 Hz) frequencies of the electroencephalogram. However, usually the two processes have been investigated separately. The present EEG study examined prediction during auditory language comprehension and preparation in spoken word production in a within-subject design while manipulating pre-target sentential constraint. Time-frequency analyses showed pre-target beta suppression in both comprehension and production when the stimulus was predictable relative to non-predictable, revealing both differences and commonalities between the two tasks. The effect was more extended in time and space (involving also alpha suppression) in production than in comprehension. By correlating the effect-related beta suppression at the cortical source level in the two tasks,

overlaps were found in the areas involved in 1) internal modeling and contextual updating, and 2) speech planning.

PS1.48. CONSTRUCTING SITUATION MODELS FROM COMICS

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University of Cyprus

Research on situation models indicates that, when instructed to attend to spatial information, people foreground spatial shifts caused by a moving protagonist. However, it is still unknown how people foreground spatial shifts in comics, which combine linguistic information with visual. In this study we asked participants to read stories presented either in texts or comics and memorize the locations of objects in the buildings where the story unfolded. We examined the foregrounding of the protagonist's movement by interrupting the reading, presenting pairs of objects, and asking participants to indicate if the objects came from same or different rooms. Results revealed faster responses for pairs of objects located in the room where the protagonist was in at the time of the interruption. This was the case with both texts and comics, suggesting that the foregrounding of spatial shifts in comics operates the same way for the two types of input.

PS1.49. HEBB REPETITION EFFECT IN VISUAL MEMORY

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Exposure to the same information leads to increased recall accuracy (or efficient learning). This is known as the Hebb repetition effect, and it has been investigated with verbal immediate serial recall tasks. Although similar effects have been observed using different paradigms in the visual domain (e.g., contextual cueing or statistical learning), it remains unclear whether the learning mechanisms between visual and verbal memory have domain-general or domain-specific features. In this study, we examined the Hebb repetition effect in visual memory with the same paradigm used in the verbal domain. The results showed that i) repetition learning in the visual domain places more importance on position-item frequency than item-item co-occurrence, suggesting that regularity learning is based on different processes that operate in accordance with the modality of input, and ii) each item should be emphasized sequentially to produce the repetition effect, suggesting the involvement of a temporal bottleneck in the process.

PS1.50. PROPRIOCEPTIVE INFORMATION MAY INTERFERE THE RECALL OF ACTION-RELATED LANGUAGE AND ALTER MOTORIC EEG RHYTHMS

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Mu (8-13 Hz) and Beta rhythms (15- 25 Hz) recorded at fronto-central electrodes are markers of motor cortical activity in humans. They are also desynchronized when reading action language, supporting embodied simulations. We analyzed the time-frequency (TF) modulation of Mu and Beta rhythms while participants learn and recall lists of sentences including manual-action or attentional verbs; to test interference with motor processes we asked the participants to keep their hands either in their Front or crossed Behind their back when learning. Results indicated that more action sentences were recalled in Front posture compared to the Behind posture; also Beta rhythms were desynchronized in the Front posture compared to Behind posture, suggesting that Behind posture interferes with motor simulation. In addition, recalled compared to forgotten manual sentences desynchronized Mu rhythms, with estimated source in the Dorsal Premotor Cortex. The present study suggests that embodied simulations are causally involved in memory retrieval.

PS1.51. ATTENTIONAL BIAS MODIFICATION IN VIRTUAL REALITY

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Attentional bias modification (ABM) aims to reduce anxiety by attenuating bias towards threatening information. The current study incorporated virtual reality (VR) technology and 3-dimensional stimuli with a dot-probe task to evaluate the effects of a VR-based ABM training on attentional bias and anxiety symptoms. A total of 100 participants were randomised to four training groups. Attentional bias was assessed at pre- and post-training, and anxiety symptoms were assessed at pre-training, post-training, 1-week follow-up, and 3-months follow-up. Change in anxiety did not correlate with change in bias. No significant difference in bias was observed from pre- to post-ABM or between groups. For anxiety symptoms, participants showed

significant reduction in anxiety scores over time. However, no other significant main effect or interactions were found. A clinically significant change analysis revealed that 9% of participants were classified as 'recovered' at 3-months follow-up.

PS1.52. DOES SELF-INVOLVEMENT OR COMPLEX CATEGORY STRUCTURE INTERFERE WITH RETRIEVAL-INDUCED FORGETTING?

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Retrieval-induced forgetting (RIF) occurs when retrieving a subset of previously learned materials impairs memory for related materials. Some findings indicate that self-involvement may enhance memory and, under some circumstances, reduce RIF. Preliminary evidence suggests that such self-involvement in the form of imagined ownership can interfere with RIF. However, a previous experiment by Englert, Tempel & Wentura (2018), using a within-subjects design and a hierarchical category structure, yielded unclear results, with an elimination of the RIF effect that was unspecific to ownership condition (self vs. other), but related to ownership bias in memory. Therefore, we conducted a follow up-experiment, investigating whether either ownership assignment at encoding (as opposed to a self-response), or a hierarchical category structure more generally would interfere with subsequent RIF. To this end, we combined a "shopping" task with a RIF procedure, comparing the ownership assignment to a control condition without self-involvement.

PS1.53. AGE EFFECTS ON ELECTRODERMAL ACTIVITY

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There is little consensus in the literature about changes of skin conductance with age. Studies employing longitudinal design are scarce, but they suggest that continuous development of underlying neural network is key issue (e.g. Gao and colleagues, 2007).

We previously reported association between age and electrodermal response amplitude (Gönye et al., 2017), and currently demonstrate consistency of electrodermal functioning in young adults (Zimonyi et al., 2019). In the present study we investigated the age from which stable electrodermal activity patterns can be detected. We also performed detailed analyses on association between age and different conductivity measures. We used data from adults and preschoolers while performing relaxation exercise and

watching movie. Both level and variability measures of skin conductance showed significant age effects ($p < 0.001$). The electrodermal level of preschoolers was higher and more variable as compared to that of adults. Results of further analyses could provide valuable insight to age-related indices of emotional functioning."

PS1.54. PROSPECTIVE MEMORY DEVELOPMENT IN SCHOOL-AGED CHILDREN: THE POSITIVE EFFECTS OF FUTURE THINKING AND PERFORMANCE PREDICTIONS ON PERFORMANCE.

Cottini, M.^{1,2}, Basso, D.¹ & Palladino, P.²

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Recent studies have suggested that children's prospective memory (PM) performance would differently benefit from encoding strategies such as imagining executing a PM task (i.e., future thinking) or predicting performance. The aim of this study was to investigate whether and how different encoding strategies would affect PM performance in school-aged children. Thus, 127 children between 8 and 11 years were assigned to four different PM encoding conditions: task difficulty prediction; performance prediction; imagination; imagination + performance prediction. Procedural metacognition (i.e., postdictions and strategy use), declarative metacognitive knowledge and working memory were also examined. Results showed that PM performance and age were positively related. The highest PM performance was achieved by children who were given combined imagination-prediction instructions. Working memory, strategy use and postdictions significantly predicted PM performance in all conditions and independently from age. This study demonstrated the beneficial effects of future thinking and metacognitive judgments on children's PM performance.

PS1.55. THE EFFICIENCY OF A NOVEL COMPUTERIZED ATTENTION TRAINING FOR CHILDREN WITH ATTENTION DEFICIT/HYPERACTIVITY DISORDER (ADHD)

Trinczer, I.L. & Shalev, L.

Tel-Aviv University, Israel

ADHD is a neurological developmental disorder, resulting in various difficulties throughout an individual's lifetime. The primary treatment of ADHD is stimulant medications that may decrease inattention symptoms while taken, but do not address the adverse academic, psychological and social outcomes of ADHD. One of the rising interventions is neuro-cognitive training - an intervention in which the various cognitive functions are viewed as abilities that can be

enhanced by training. Hence, the aim of the present study was to investigate the efficiency of a novel computerized attention training - the Cogmission software, in the case of school-children with ADHD. The sample included 80 children, aged 8-12 years old, diagnosed with ADHD, divided into 3 groups: attention training, active control, and passive control. A significant improvement in sustained attention was obtained in the attention training group, whereas no similar effect was recorded in the control groups. Implications of the results are discussed.

PS1.56. HOW MUCH CAN YOU SEE?: THE ROLE OF OUR INDIVIDUAL DIFFERENCES OVER OUR PERCEPTION DURING READING

Antúñez, M., Hernández-Ramos, L., Meseguer, E., Dampuré, J., Rivero, F., Hernández-Cabrera, J.A. & Barber, H.A.
Universidad de La Laguna

During reading, we simultaneously perceive, process and integrate information that is presented both in foveal and parafoveal visual regions. However, the amount of information that can be obtained is determined by the limited visual processing of each specific subject. Although past research has addressed this topic through the study of different perceptual spans and how they can be modified through intrinsic properties of the task, less attention has been allocated over their relationship with the individual differences inherent to the subjects. We hypothesized that different individual characteristics of each subject could mediate the size of the various perceptual spans, and that those spans could affect the ability of the participants to obtain and process the information presented on the parafoveal region of the visual field. In this research, we estimated the perceptual, visual and visual attention span of the participants through different standardized tasks. On the other hand, they filled different questionnaires to estimate their working memory and reading skills, as well as their reading, video game and sports habits. Additionally, we used the coregistration of eye movements and EEG measures to obtain Fixated Related Potentials (FRP) and eye movements measures, so that we could estimate their ability to process and integrate the semantic and lexical characteristics of words presented in the parafoveal region. Our results suggest that different individual characteristics mediate the size of the perceptual spans and that indirectly may affect the effectiveness of the parafoveal processing.

PS1.57. PROCESSING OF ENVIRONMENTAL GEOMETRY IN MINIATURE BRAINS: SPATIAL MEMORY IN THE HOUSE CRICKET (*ACHETA DOMESTICUS*)

Baran, B.¹, Krzyżowski, M.¹, Francikowski, J.¹ & Hohol, M.^{2,3}

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Recently, navigational behavior of insects is claimed to be performed via view-matching. However, one cannot exclude that miniature brains can encode layout geometry and use it for navigation, as Spelke's core cognition account predicts. In the study, we tested whether crickets (N=45) can locate the center of the arena relying only on geometric cues. We used a set of heated different shape arenas (circle, square, triangle) with cool spot located centrally (Tennessee-Williams Paradigm). In all the arenas, insects learned to locate the center efficiently. Next, we aimed to test whether this pre-learned knowledge generalizes among different arenas. So far, insects previously trained to navigate in the square were tested in the triangular arena. Their performance was then compared to the score of the untrained insects. The results of this part seem to suggest no generalization, nevertheless it is needed to increase the sample size and include more shape conditions.

PS1.58. THE (EXPERIMENTAL) INSTANCES OF COGNITIVE PENETRATION ARE EXPERIMENTAL ARTIFACTS DUE TO THE MAGNITUDINAL OPERATIONALIZATION OF PERCEPTION

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There is a spurt, in recent times, of findings that purportedly showed that non-sensory processes like concepts, language, emotions, actions, motivation, and social situations etc., affect perceptions – the notion of “cognitive penetration”. However, these findings are criticized to be due to many experimental pitfalls, by researchers like Chaz Firestone and Brian Scholl. I review these (experimental) instances of cognitive penetration and show that all of their pitfalls can be consolidated into the “single” and the very “crucial” pitfall or artifact of “the operationalization of the perception to be magnitudinal or analog” (such as how bright is the color or how loud is the sound etc.,) rather than the operationalization of the perception to be discrete (such as what color is it or what sound is it etc.,). I also argue that the instances of cognitive penetration are mere judgment-effects rather than perceptual-effects as they operationalized perception to be magnitudinal

PS1.59. NEURAL CORRELATES OF EXECUTIVE DYSFUNCTIONS IN ACADEMIC PROCRASTINATORS

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Procrastination is associated with increased impulsivity and executive dysfunctions (Gustavson et al., 2015; Michałowski et al., 2017). Using event-related potentials, we investigated the influence of reward and punishment motivation on neuronal indicators of error processing in academic procrastinators and controls during a monetary go/no-go task. Procrastinators responded with less pronounced error processing (Error Related Negativity) than controls and this group effect was not modulated by motivation type or task difficulty. According to behavioral data, procrastinators responded with greater post-error slowing (PES) during high than low difficulty condition, an effect that was not observed in controls. No significant group differences were observed for reaction time, performance accuracy and for other ERP components. This pattern of results suggests that procrastination-related error processing deficits cannot be reduced when monetary reward is expected. At the same time, procrastinators seem activating more pronounced error processing when the task they perform becomes more difficult

PS1.60. WHAT ABOUT DIGITS IN A CONTINUOUS NAMING TASK?

Herrera, A.

University of Murcia (Spain)

There is evidence showing that digits may be named both through a semantic and an asemantic route. These findings support the existence of a dual route being one of them dominant in each specific situation. The present study explored this issue by using a continuous naming task and analyzing the cumulative semantic interference, the increase in the naming latencies for every successive within-category item that is named. Participants were presented with a sequence of items from several semantic categories in a seemingly random order. Numbers were included as one of the categories and they were presented either in the same notation (i.e., as digits) or in a different notation (i.e. as number words, as a set of dots). The results showed differences as a function of notation which are discussed under current theories of language production.

PS1.61. ATTENTIONAL CAPTURE BY ANGRY FACES IS CONDITIONAL ON GROUP MEMBERSHIP AND SOCIAL STATUS
 Victeur, Q., Normand, A., Martinot, D., Berthon, M., Huguet, P. & Silvert, L.
Université Clermont-Auvergne (UCA), France.

Preferential selection of faces expressing negative emotions (e.g., fear or anger) has been repeatedly reported in the literature and is often taken as evidence that the selection of threat-related stimuli is a fully automatic process. However, appraisal theories of emotion predict that emotional attention should rather be conditional on the appraised relevance of the emotional stimulus according to the current concerns of individuals. In two studies, we investigated whether attentional capture by angry face cues in a dot-probe task could be conditional on their social relevance for the observer. Rather than being fully automatic, attentional capture by angry faces appeared to be conditional to the group-membership of the faces (i.e., preferential capture by out-group angry faces), as well as to the social status of the observer (i.e., preferential capture by angry faces among low status individuals). These new results support the social conditionality hypothesis of emotional attention.

PS1.62. WORKING MEMORY AND SPONTANEOUS SENSATIONS: HOW ARE VISUOSPATIAL WORKING MEMORY PROCESSES IMPLICATED IN BODY AWARENESS?
 Salgues, S., Plancher, G. & Michael, G.A.
Université Lyon 2, France

Being aware of our own body requires maintaining body representations through focusing on body-related information such as the one provided by spontaneous sensations (SPS). Lesions in the parietal lobe impair the body-representation maintenance, causing one to lose awareness of their body-parts within minutes. Little is known about the involvement of working memory, a cognitive construct dedicated to maintenance, in body and self-awareness. Given that spatial vision plays an important role in self-awareness, in the present study we investigated the implication of visuospatial working memory (VSWM) processes in body-awareness, through SPS. The effects of decline, interference processing and maintenance on VSWM recall performance were correlated to SPS perception over the hands. Participants showing greater decline, greater sensitivity to interference and lower maintenance in VSWM were also those with lower perception of SPS. These findings allow us to discuss the involvement of VSWM processes in body and self-awareness.

PS1.63. THE DOG (CANIS FAMILIARIS) AS A MODEL FOR HEMISPATIAL NEGLECT
 Bolló, H. & Kis, A.
Hungarian Academy of Sciences

Family dogs are good translational models for several human psychiatric disorders as they show many of the behavioral symptoms naturally. The present study is a pioneer to relate human neglect disorder to dogs' side-bias. Family dogs (N=22) with previous history of side-bias in cognitive experiments participated in a series of two-way food choice tasks with two identical containers and a food bait in each. N=19 dogs showed 100% side-bias in at least one situation. Side preference was conserved in 78% of the dogs even when the test setup was rotated with 90 degrees. Furthermore, side preference changed in 68% of the subjects between near and far distance choices. But, there was no significant population-level bias to either left or right. We conclude, that similarly to human neglect, dogs' side-bias is egocentric and shows a double dissociation between peri- and extrapersonal space. However, contrary to humans, there is no population-level side-bias.

PS1.64. MEASURING FUNDAMENTAL MOVEMENT SKILLS IN CHILDREN WITH AUTISM SPECTRUM DISORDER
 Gandotra, A., Kotyuk, E., Cserjési, R., & Szekely, A.
ELTE Eötvös Loránd University, Hungary

We review existing standardized batteries to measure fundamental movement skills (FMS) in children with Autism spectrum disorder (ASD). The study selection criteria included a) participants not more than 12 years of age, (b) batteries assessed at least one FMS component (c) published in a peer-review journal and (d) printed in English. A total of 23 articles that met the inclusion criteria were selected from different databases.

Majority of these studies found impairment in FMS for ASD children. An important drawback of existing batteries is that they do not provide information about quality of movement e.g. whether it was clumsier or less well-coordinated. This limitation thus, facilitates a strong need to develop technology assisted measurements to monitor multiple facets of the movements in an unobtrusive way in real-time, convenient for practitioners for improved assessments. In the present poster we propose a device capable of providing precise measurement about movements.

PS1.65. DURABILITY OF EVENT-SPECIFIC REPRESENTATIONS IN FOREPERIOD DESIGNS: PROBABILISTIC ACTION BIASES WEAKEN WITH TIME

Steinborn, M.B.¹, Langner, R.², Cao, L.¹ & Huestegge, L.¹
 1 University of Wuerzburg, 2 University of Duesseldorf,

The constant-foreperiod effect refers to an increase of reaction time (RT) with increasing foreperiod (FP) length. Proceeding from a pioneering study (Holender & Bertelson, 1975), we examined whether probabilistic event-specific action biases in choice-RT tasks remain stable over time, or not. In three experiments, we examined performance as a function of constant-FP length (1000 vs. 5000 ms) and action bias (low vs. high event frequency). As a result, action bias occurred predominantly in short-FP trial but decreased in long-FP trials, indicating weakened selectivity of temporal expectancy with time. Crucially, the interactive effect of FP length and action bias on performance was completely abolished when the intertrial-interval was further increased. These results challenge the popular belief that event-specific contributions to performance are a stable part of the mental representation that guide temporal expectations in FP situations, given that probabilistic action arises from a transient activation that merely superimposes on performance effects.

PS1.66. SEMANTIC INTERFERENCE AND PHONOLOGICAL FACILITATION IN PICTURE-WORD INTERFERENCE

Madec, S., Elbuy, S., Villinger, T. & Bürki, A.
 Universität Potsdam, Germany

When speakers have to name pictures in the context of distractor words, the time to initiate a vocal response depends on the nature of the relationship between the word to be named (target) and the distractor. Compared to an unrelated distractor word, response latencies are shorter when the distractor is phonologically related to the target word, and longer when it is a member of the same semantic category. The present study examines the electrophysiological signature of these effects and their time course at the group level, and seeks to describe and explain between-speaker variability in these effects and their time course. Forty participants were asked to name a set of 90 pictures in the context of semantically and phonologically related and unrelated distractor words, and to perform a battery of general domain cognitive function tests. Results will be discussed in the context of models of lexical access and semantic interference.

PS1.67. SPATIAL-TEMPORAL PREDICTIONS IN A VISUAL SEARCH TASK

Shalev, N., Boettcher, S.E.P. & Nobre, A.C.
 University of Oxford

Anticipation of future events influence behaviour by shaping the quality of perception and allowing us to prepare relevant responses. Such temporal predictions can also be utilised to guide spatial behaviour: for example, being able to anticipate when a traffic light will turn green, allows us to divert spatial attention from the road and re-engage when necessary. We investigate the guidance of spatial attention based on temporal anticipation in a dynamic visual-search task, in which multiple targets and distractors faded in and out at different locations and times during each trial. In a series of experiments, we manipulate the spatial and temporal predictability of targets to show how people form temporal anticipation dynamically to guide spatial attention. We use eye-tracking to highlight how predictions change spatial-attention trajectories and strategies. The data we present shows a clear demonstration of spatial-temporal predictions: how they are formed dynamically and utilised to improve performance.

PS1.68. UNCONFOUNDING COMPATIBILITY EFFECTS WITH GRASPABLE OBJECTS

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 1 University of Modena and Reggio Emilia, Italy; 2 University of Bologna, Italy

Previous research investigating handle-response compatibility effects with graspable objects mixed different categories of objects as stimuli. We examined whether different types of object may elicit different types of compatibility effects.

Objects having a handle opposite to either a visible or a latent goal-directed functional component located on the horizontal axis (i.e., handle-function and handle-only objects, respectively) were presented randomly mixed within blocks (Experiment 1) or separately in different blocks (Experiment 2). In Experiment 3, handle-only objects had a latent goal-directed functional component on the vertical rather than the horizontal axis. In all three experiments participants were required to judge the material (plastic, metal) the object was made of. Results showed that the handle-response compatibility effect was influenced by the visibility of the functional component (visible versus latent), the type of presentation of objects (mixed versus blocked) and the axis the latent goal-directed functional component was on (horizontal versus vertical axis).

PS1.69. A SYNTHESIS OF NOVEL METHODOLOGICAL APPROACHES FOR STUDYING CREATIVE PROBLEM-SOLVING AND ARTISTIC PERFORMANCE ACROSS MULTIPLE DISCIPLINES

Fine, P.A.¹, Danek, A.H.², Friedlander, K.J.¹, Hocking, I.³ & Thompson, W.F.⁴

1 University of Buckingham, UK; 2 Universität Heidelberg, Germany; 3 Canterbury Christ Church University, UK; 4 Macquarie University, Sydney, Australia

Given the breadth of creativity research, investigating the creator, the creative process, the creative product, and environmental influences, it is important to integrate research ideas, methods and findings across multiple disciplines. Such cross-fertilisation allows the development of novel methodological approaches, by: employing traditional methodologies to investigate hitherto unresearched domains; utilising recent technological advances and increased accessibility to domain-specific online populations; and juxtaposing methods from multiple domains and disciplines in a novel way. This presentation draws from a Frontiers in Psychology Research Topic which we have recently edited, containing 26 articles which cover cognitive creativity (insight problems; divergent thinking tasks), visual art (painting; fashion), and performing arts (music; dance). We will highlight the most innovative approaches currently used in the study of creativity and discuss how they could be implemented in all three domains, with the aim of contributing both to increased multidisciplinary and more convergent research methods in this field.

PS1.70. PHONEME-ORDER ENCODING DURING SPOKEN WORD RECOGNITION

Dufour, S. & Grainger, J.

CNRS & Aix-Marseille University

We examined priming effects where primes were formed by transposing the first and last phoneme of target words (/byt/-/tyb/). In comparison to an unrelated condition, auditory lexical decisions were found insensitive to this transposed-phoneme priming manipulation in a long-term priming experiment, with primes and targets presented in separated blocks of stimuli, while a repetition priming effect was observed (/tyb/- /tyb/). However, a clear transposed-phoneme priming effect was found in a short-term priming experiment, with primes and targets presented in close temporal succession. Importantly, no priming effect was found with prime-target pairs sharing the medial vowel (/jyp/-/dyn/), thus indicating that the transposed effect is not due to vocalic overlap. These results provide further evidence for a role for position-independent phonemes in spoken word recognition, such that a phoneme at a given

position in a word also provides evidence for the presence of words that contain that phoneme at a different position.

PS1.71. DISCREPANCY BETWEEN IMPLICIT AND EXPLICIT SELF-ESTEEM AS A PREDICTOR OF LIFE SATISFACTION

Taraday, M., Balas, R., Sarzyńska, J., Łakuta, P., Šaban, I., Mieszkowski, M., Osęka, L., & Rosocha, A.

Institut of Psychology, Polish Academy of Sciences (PAN)

Creemers, Scholte, Engels, Prinstein & Wiers (2012, 2013) showed that implicit and explicit self-esteem interaction was associated with suicidal ideation. The size of the discrepancy between these two types of self-esteem was positively associated with depressive symptoms, suicidal ideation, and loneliness, but only for so called “damaged” self-esteem. There was no such effect for the opposite configuration of self-esteem measures, which authors call a “defensive” or “fragile” self-esteem. In the presented study (N = 427) measures of implicit (name-letter task; Hoorens, 2014) and explicit (Single-Item Measure; Robins, Hendin & Trzesniewski, 2001) self-esteem were taken, accompanied with predictions of life-satisfaction based on electronic traces from social-media activity (Facebook LikeIDs; Youyou, Kosinski & Stillwell, 2015) and self-description. Results showed that “damaged” self-esteem was associated with lower life-satisfaction. Also, higher levels of self-description abstractness were negatively associated with explicit self-esteem and could be used as its measure (Tanis, 1999).

PS1.72. ATTENTIONAL CAPTURE: THE ROLE OF PERCEPTUAL LOAD IN THE PROCESSING OF DIFFERENT DISTRACTOR STIMULI

Greta, M.¹, Elisa, M.A.¹, Fabiano, B.¹, Eva, F.¹, Vera, F.², & Juan, L.¹

1 University of Granada, Spain; 2 University of Parma, Italy

Attentional capture seems to be modulated by task demands and distractor display in relation to the target array. In the Lavie’s perceptual load framework (Lavie, 1995), authors usually use a modified flanker task by separating distractor location and potential target position, with distractor interference diminishing when perceptual load increases. However, in the Gaspelin’s dwelling hypothesis framework (Gaspelin, et al. 2016), by using a similar paradigm but with an abrupt onset (or different color) distractor within the relevant-search array, distractor interference increases with higher perceptual load. The current study aims to test and compare the perceptual load theory and the attentional dwelling hypothesis within the same paradigm in a series of three experiments by manipulating

the perceptual load and the distractor display (inside or outside of the target-search array). Results show that the influence of perceptual load on attentional capture seems to depend on the relationship between distractor and target.

PS1.73. COGNITIVE BIASES IN NON-SYMBOLIC ADDITIONS
Sessa, N.¹, Frede, V.² & Charras, P.¹

1 Univ Paul Valéry Montpellier 3, Univ. Montpellier, Montpellier, France; 2 Université Toulouse - Jean Jaurès, France

Mental additions are affected by many cognitive biases such as the operational momentum according to which additions are overestimated. Additionally, commutativity is violated in symbolic additions since the degree of overestimation is clearly modulated by the order of operands ($1+2 \neq 2+1$; Shaki et al. 2015). In contrast, symbolic additions with repeated operands ($24+24$) are also biased but towards an underestimation, referred to as the symmetry bias (Charras et al., 2012, Shaki & Fischer, 2019). Since, the violation of commutativity and the symmetry bias have only been observed in symbolic additions, we aim to further investigate these biases in approximate arithmetic. Participants were to judge as small or large the sum of two dot arrays presented either successively or sequentially. Additions could either be ascending asymmetric ($18+30$), descending asymmetric ($30+18$), or symmetric ($24+24$). Results reveal that sequential vs. simultaneous presentation differentially affects the violation of commutativity and the symmetry bias.

PS1.74. IS THERE ANYTHING IN RISK BESIDES TENDENCY TO EXPLORATION AND HIGH REWARDS DISCOUNTING?

Smoleń, T.¹, Fryt, J.², Czernecka, K.², Szczygieł, M.² & La Torre, A.¹

1 Jagiellonian University, Poland; 2 Pedagogical University of Krakow, Poland

In the study the hypothesis that the risk is usually an adaptive strategy was tested. We based on an observation that adolescents and adults show different patterns of risk taking. It was assumed that if the risk is an adaptive strategy the said differences may stem from different situation that adolescents and adults have in the environment (e.g.: knowledge of the environment and relative socioeconomic status). Accordingly, the difference would result in dissimilar styles of tackling the uncertainty of the environment (exploration and sensitivity to high rewards). Consequently, we designed a complex risk task in which adolescents and adults face uncertainty concerning both the consequences of their choices and the features of the

environment. We tested whether the risk can be reduced to tendency to exploration and sensitivity to high rewards and if these variables differ among adolescents and adults. Obtained results support our hypothesis.

PS1.75. TROUBLE DOWN MEMORY LANE: MISREMEMBRANCE REVEALS ENCODING DIFFERENCES IN ARITHMETIC WORD PROBLEMS.

Gros, H.^{1,3}, Thibaut, J.P.² & Sander, E.³

1 University Paris Descartes; 2 University of Bourgogne Franche-Comté; 3 University of Geneva

Is there a fundamental difference between counting years and kilograms? Marbles and centimeters? Floors and euros? Recent evidence suggests that non-mathematical world knowledge unrelated to the mathematical structure of a problem can nevertheless influence its semantic encoding. To tackle this question, we created arithmetic problems devised to promote contrasting encodings by featuring different quantities. We designed three experiments investigating problem representation and recollection with a total of 200 participants, in French and in English. After solving a series of problems, participants were given an unexpected task: either recall the problems (Experiments 1 and 2) or identify experimenter-induced changes in target problem sentences (Experiment 3). Results across all three experiments consistently indicate that participants construct and memorize a different problem encoding depending on the quantities involved. This suggests that knowledge related to daily-life quantities such as weight or duration substantially influences arithmetic reasoning, despite such knowledge being irrelevant for abstract reasoning.

PS1.76. NEURAL SIGNS OF PERSONAL IDENTITY AND FRIENDSHIP IN THE LIFETIME

Muñoz, F., Rubianes, M., Casado, P., Jiménez, L., Fondevila, S., Hernández, D., Sánchez, J., Espuny, J. & Martín-Loeches, M.

Complutense University of Madrid, Spain.

This study explored the ERP modulations related to identity recognition, and those related to life stage identification. For face identity recognition, later positivity modulations would be larger to self-identity and lower to unknown-identity, reaching self-familiar in an intermediate position. For life stage identification, later positivity would be larger to adulthood and lower to infancy, being adolescence in an intermediate position. Results on identity yielded later positivity that was statistically significant self > familiar > unknown during 400-600 ms at fronto-central

sites. Beyond 700 ms, later positivity to self and familiar displayed similar amplitudes, compared to unknown. Stage identification yielded statistical difference adulthood > adolescence > infancy during 400-600 ms at fronto-central sites. This study extends current findings on how the brain represents personal identity at different stages of life in autobiographical memory, but also in close relationships with our close friends since infancy to adulthood.

PS1.77. CUE COMPETITION AND INCIDENTAL LEARNING: NO BLOCKING OR OVERSHADOWING IN THE COLOUR-WORD CONTINGENCY LEARNING PROCEDURE WITHOUT INSTRUCTIONS TO LEARN

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Overshadowing is the finding that learning about a cue (X) is reduced when that cue is always accompanied by a second cue (A) during the learning phase (AX). Blocking is the finding that after learning a stimulus-outcome relation for one stimulus (A), learning about a second stimulus (X) is reduced when the second stimulus is always accompanied by the first stimulus (AX). The present work examined whether overshadowing and/or blocking are present in an incidental learning procedure, where the predictive stimuli (words or shapes) are irrelevant to the cover task and merely correlated with the task-relevant stimulus dimension (colour). In two large online studies, we observed no evidence for overshadowing or blocking except in participants that were given the explicit instructions to learn contingencies. Together, these results suggest that contingencies of blocked/overshadowed stimuli are learned incidentally, but are suppressed by explicit decision processes due to knowledge of the contingencies.

PS1.78. BOOSTING COGNITION WITH MUSIC: ERPS DURING AN AUDITORY, SEMANTIC AND EMOTIONAL ODDBALL TASK

Morales, L.¹, Galvao, A.¹, Morales, J.¹, Tajadura-Jiménez, A.², Postigo-Alonso, B.¹

1 Universidad Loyola Andalucía, Spain; 2 University Carlos III, Spain

Music exposure conveys beneficial cognitive effects for normal and pathological cerebral functioning. We present preliminary data from a study that evaluates the potential effects of music on cerebral processing in a sample of healthy participants. We measured both the P300 and the N400 ERPs in participants that were exposed to several musical excerpts. Both components were measured using

an oddball paradigm task that evaluated three different levels of processing: pitch discrimination, semantic and emotional processing. The participants were exposed either to musical stimulation (experimental condition) or silence (control condition) during 2-minute resting periods between blocks and tasks. The results of this protocol study reveal that musical stimulation modulates the ERPs corresponding to the cognitive processing involved in the performance of these tasks. The data are discussed in terms of the beneficial effects of music on cognition in the context of an overall cortical arousal related to attentional and emotional processes.

PS1.79. AUTOMATED EXTRACTION OF VISUAL SCANPATHS

Reynaud, E., François Osiurak, F. & Navarro, J.

University of Lyon, France

Eye-tracking methods allow us to gather information on how the brain processes information. If classical analysis has led to very important results, they often remain centered on the analysis of static scenes. Nevertheless, in real life, information is very often dynamical, for example because we move in our environment. This calls for new automated analysis methods that can allow the tracking of visual moving objects, and to dynamically partition the visual scene in reference to moving objects for example. We present a method for extracting sequences of visual fixations in a dynamic scene. We aimed to characterize the visual behaviors of participants performing a car-following task in a simulated driving environment. Visual scanpaths, automatically extracted, will be compared and related to driving behavioral performance.

PS1.80. DECADE-CONSISTENCY EFFECT IN MULTIPLICATION: THE INFLUENCE OF THE PLACE-VALUE STRUCTURE IN THE RETRIEVAL PROCESS

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Multidigit Arabic numbers are processed in a componential fashion according to their place-value structure. The Interacting Neighbors Model proposes that multiplication fact retrieval is also affected by the place-value structure of the product (e.g., operands 4x7 coactivates the decomposed representations of the decade "2" and the unit "8"). This study investigates how this componential representation influences the retrieval process. Thirty participants evaluated the correctness of multiplication equations, where the result was preceded by a masked prime (presented for

30 ms). For correct equations (e.g., $4 \times 7 = 28$), prime relatedness and decade-consistency were manipulated: neighbor consistent (24), neighbor inconsistent (32), unrelated consistent (23) or unrelated inconsistent prime (31). RTs of small problems were only influenced by relatedness, whereas large problems were only influenced by decade-consistency. These results provide evidence for a componential representation and suggest that relatedness and decade-consistency affect different stages of the retrieval process.

PS1.81. SLEEP DOES MAKE OUR MEMORIES MORE ACCESSIBLE

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This study used a Reicher-Wheeler paradigm to assess whether sleep makes memories more accessible (cf. Schreiner & Rasch, 2018 vs. Dumay, 2018). Participants learnt made-up orthographic neighbours of existing words (e.g., 'lefture' from 'lecture') via repeated study-and-test cycles. Whereas the PM group learnt Set 1 at 8pm and Set 2 at 8am the next day, the AM group learnt Set 1 at 8am and Set 2 at 8pm on that same day. At the 12-hr test (immediately after learning Set 2), the PM group showed additional, offline learning, such that performance was better for 12-hour-old Set 1 pseudowords and worse for their basewords, relative to their Set 2 counterparts just learnt. The AM group, in contrast, showed forgetting over the course of the day, until sleep allowed Set 1 to recover by the 24-hr re-test. Sleep therefore not just prevents forgetting or enables recovery, it does make memories more accessible.

PS1.82. DOES THE USE OF IMPLEMENTATION INTENTIONS LEAD TO INFLEXIBLE HABITS AND INCREASED AUTOMATICITY? AN EXPERIMENTAL INVESTIGATION

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It is often challenging to achieve goals, despite strong intentions. The use of if-then plans ('implementation intentions') has been shown to promote the translation of intentions to actions, possibly by creating 'instant habits' (Gollwitzer 1999). Creating such instant habits should lead to benefits in terms of efficient goal attainment but may at the same time come at the expense of flexibility. To test these predictions, we will train participants ($n=100$) using either verbal implementation or goal intentions to respond in the presence of certain stimuli to earn rewards. We will

then assess automaticity of responding using the Self-Report Behavioral Automaticity Index (Gardner et al. 2012). In the subsequent test phase, some outcomes change in value and we measure to what extent participants flexibly adjust their behavior. We hypothesize that participants trained with implementation intentions (compared to goal intentions) will show increased automaticity and inflexible, habitual responding in the test phase.

PS1.83. ANTICIPATED WARM-GLOW AND GUILT INCREASE THE INTENTION TO HELP A PERSON IN NEED IN EPISODIC SIMULATION

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People can imagine their possible behavior in the future, this act is known as episodic simulation, similar to remembering their past behavior. Previous evidence indicated that imagining helping behavior in response to stories describing a person in need increase the intention to help him/her. Furthermore, anticipated emotions affected such enhancement. Here, we focused on specific anticipated positive and negative emotions such as warm-glow and guilt. We investigated the roles of anticipated warm-glow and guilt on enhancing the intention to help in episodic simulation through three online experiments. In experiment 1, we try replicating the previous findings via online. Experiments 2 and 3 considered whether anticipated warm-glow and guilt affect the intention to help. The results demonstrated that both anticipated warm-glow and guilt were positively associated with the intention to help. Our findings suggest that people might use anticipated emotion in episodic simulation as cues that guide helping behavior.

PS1.84. WHEN PROCESSING DISTRACTORS IMPROVES WORKING MEMORY PERFORMANCE: THE ROLE OF REPEATED FREE PAUSES DURING A COMPLEX SPAN TASK

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Interrupting a memorization process with a distracting event is known to have a detrimental effect on memory. Fortunately, counteracting forgetting is possible during free pauses. While the detrimental effects of distractors have been well-documented because it provided insights to question the source of forgetting (decay vs. interference), the precise role of the free periods of time is still unclear, in particular when they are repeated. The present study proposes an extension of the computational model

TBRs* to account for a counterintuitive positive effect of the number of distractors observed in a complex span task (Jarjat et al., 2018) that could be attributed to repeated free pauses following distractors. In this extended model, a specific maintenance mechanism operates during free pauses to link working memory and long-term memory when attentional refreshing becomes ineffective. Comparing model outcomes to experimental datasets confirmed that elaborative maintenance has to be considered in future studies.

PS1.85. EVIDENCE FOR CONTINUOUS LATENT-STRENGTH MODELS OF VISUAL WORKING MEMORY FROM A CRITICAL TEST

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Discussions on the nature of visual working memory (VWM) have mostly focused on two accounts: discrete-state models and continuous latent-strength models. Whereas traditional paradigms (e.g., change detection tasks with binary response formats) often yield evidence for discrete-state (or slots) models, newer paradigms (e.g., continuous color reproduction tasks) tend to yield evidence for continuous resource models. We developed a novel two-alternative forced choice task with confidence judgments and colors sampled from a continuous color space. To distinguish between both model classes, we use a critical test with minimal assumptions (and without model fitting; Kellen & Klauer, 2015), that so far has not been used appropriately in VWM. Critically, we introduced a non-obvious difficulty manipulation (easy trials and difficult trials randomly intermixed). The two accounts make opposite predictions about the error response patterns in confidence judgments between difficulty conditions. We found evidence for continuous latent-strength models.

PS1.86. THE VALUE OF EURO BANKNOTES: RELEVANCE OF SIZE, COLOR AND DESIGN

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In the current study, we evaluate the relative importance of the three physical dimensions of banknotes when people processed their monetary value. Three Stroop-like tasks were designed, in which a pair of banknotes were presented and participants selected the one with the higher monetary value. In each task, a different physical dimension (colour, size and design of banknotes) were examined in a congruent and an incongruent condition (the value of the physical dimension corresponded or not to its

real value) which were compared to a neutral condition (no information about the physical dimension was provided). The results revealed that size was the most important dimension to access the monetary value of banknotes, following by colour. Importantly, the analysis of the banknote design reduced the efficiency with which the monetary value was processed. The results are discussed around how to design banknotes by optimising the processing of their physical characteristics.

PS1.87. IS THE CROSSMODAL ASSOCIATION BETWEEN PITCH AND SPATIAL ELEVATION AUTOMATIC?

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Why do we always associate high- and low-pitched sounds with above and below, respectively? Ample experimental evidence suggest that the brain generates integrated representations of pitch and spatial elevation. Nevertheless, previous literature do not offer a clear description of the mechanisms underlying these crossmodal representations. We still do not know whether they emerge automatically (i.e., without the need of placing our attention on any of these perceptual dimensions) or not. In order to analyze the possible automaticity of this widespread crossmodal association, we conducted several experiments and obtained a variety of behavioral and electrophysiological measures. Our findings indicate that the association between pitch and spatial elevation occur, at a neural level, more automatically than previously thought. At the same, however, we also found evidence suggesting that these crossmodal representations are influenced by experience and language (i.e., the presence of spatial connotations of words describing pitch, in a particular language).

PS1.88. EXPLORING THE EFFECT OF MICRODOSING ON CREATIVITY: A LONGITUDINAL DOUBLE-BLIND RANDOMIZED PLACEBO – CONTROLLED TRIAL

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Taking microdoses of psychedelic substances, allegedly has multiple benefits, including enhanced creativity, potentially through targeting serotonergic 5-HT_{2A} receptors. In the current study fifty-nine healthy volunteers have been randomly allocated in a double-blind manner to either a

placebo or experimental condition and then received either 6 microdoses of 0.23 grams of dried truffles or cellulose which they consumed over the course of two weeks. Truffles were post-hoc analyzed for their psilocybin content. Participants creativity was assessed by the means of Picture Concept Task (PCT) measuring convergent thinking and the Alternative Uses Task (AUT) assessing divergent thinking at the baseline and after the 2nd and 6th microdose. We found improved performance on the AUT in the experimental group as compared to placebo, yet no changes were observed for the PCT. The results suggest that microdosing psychedelics improve divergent qualities yet, this effect does not generalize to persistence heavy convergent task.

PS1.89. TECHNOLOGICAL ADVANCES AND CONCEPTUAL PLURALITY: THEORETICAL CHALLENGES FOR BODY IMAGE RESEARCH

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Body image is a complex phenomenon comprising explicit and implicit dimensions about how we perceive our body. The concept has been studied by different fields of investigation and the results have not converged towards a unified comprehension of its nature and manifestation. Recently, more sophisticated measures of body image have been developed. This study sought to systematic review the use of body image software in scientific research. Four databases were examined from 2000 to 2018. Thirty-five peer-reviewed articles were selected, which resulted in eleven different body image software. Some advances are the manipulation of one's own image and selective changes in body parts, amplifying ecological validity. Even though technological advances were observed in the field, divergences of results between studies remained suggesting a probable theoretical cause. Furthermore, no software was found to assess the implicit dimension of body image, pointing to a gap in the recent investigation of the phenomenon.

PS1.90. FROM SNARC TO SWARC: EVIDENCE OF VERTICAL SPATIAL REPRESENTATIONS FOR WEIGHT

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Smaller numbers are typically responded to faster with a bottom-side than a top-side key, whereas the opposite occurs for larger numbers (a vertical spatial-numerical association of response codes, i.e. the vertical SNARC effect). Here, in four experiments, we explored whether a similar

pattern of results can emerge for lighter vs. heavier items. Participants were presented with central target stimuli describing materials (e.g., "iron" vs. "paper"; Experiment 1), numerical quantities of weight (e.g., "1 g" vs. "1 kg"; Experiment 2) or pictures associated to real objects weighed before the experiment (e.g., lighter vs. heavier spheres; Experiments 3a/3b). Target had to be classified as either lighter or heavier by pressing vertically-placed keys. In Experiments 1-2, faster responses emerged for the lighter-bottom/heavier-top mapping, whereas in Experiment 3 faster responses emerged for the lighter-top/heavier-bottom mapping. Overall, these results provide evidence for a vertical – context dependent – spatial-weight association of response codes (i.e., a SWARC effect).

PS1.91. PERFORMANCE MONITORING AND METACOGNITION. THE INFLUENCE OF RESPONSE ON DECISION CONFIDENCE

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We investigated whether the results of performance monitoring inform confidence in perceptual decisions. In two experiments, after stimulus presentation but before stimulus-related response (SR) and confidence rating, a cue was presented that was irrelevant to the main task but required response that was fully congruent or incongruent with the correct SR (the same response set as SR) or partially congruent or incongruent (different response set). The results showed that decision confidence was higher when a cued response used the same response set as SR, independently of its congruency. In Experiment 3 we investigated the influence of relevant motor response on confidence by asking participants to respond only in case of a certain decision outcome. Confidence in decision was higher after a motor response compared to decision-only condition. The results suggest that metacognitive judgments are based on the outcome of performance monitoring, such as response time or error detection.

PS1.92. THE USE OF NETWORK TOOL FOR BRAIN SIGNAL DATA ANALYSIS: A CASE STUDY WITH BLIND AND SIGHTED INDIVIDUALS

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Advancements in technology have allowed to obtain and transform surveys data from Biology and Neuroscience. Networks have long been used to represent and analyze biological processes, but not directly for interpretation of data obtained from brain functions, asking for new perspectives of development in Neuroinformatics using existent models of tools already disseminated by the Bioinformatics. This study includes an analysis of electroencephalogram (EEG) signals, using the Cytoscape, a software for visualizing networks in biological databases. The data were obtained from a comparative case study using EEG signals from a Brain Computer Interface (BCI) with 32 electrodes prepared in the brain of a blind and a sighted individuals during the execution of an activity that stimulated the spatial ability. This study intends to present results that leads to better ways for use and adapt techniques that support the data treatment of brain signals for elevate the understanding and learning in Neuroscience.

PS1.93. SPATIAL AND MOTOR ABILITY CONTRIBUTE TO EXPLAIN MATHEMATICAL PERFORMANCE IN 6 TO 9 YEARS-OLD CHILDREN

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Embodied cognition focuses in motor ability to explain the development of complex cognitive processes, as mathematical ability or spatial cognition, both highly linked in all educative stages. Concretely, it was observed that cognitive factors (visuospatial skills and intelligence) as well as motor ability contribute to math achievement. However, none studies have involved all of them together to explain math performance. The aim of this research is to examine the roles of cognitive and motor factors in math achievement in primary school children. A total of 308 students ranging from 6 to 9 years of age (146 females) were assessed on visuospatial abilities, motor skills, fluid intelligence and mathematical competences. The results showed that all factors explained a total of 18% of math performance variance. It can be concluding the importance to consider visuospatial factors and motor abilities to explain part of the math success in primary school children.

PS1.94. DID HE HIT YOU OR PUSHED YOU? BEHAVIORAL EVIDENCE OF EMOTIONAL REGULATION THROUGH REFORMULATION

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The words we use when describing stories are causally involved in how emotional experience is interpreted, understood and represented. Using semantically related verbs has proven to alter the reconstruction of events, appearing more or less serious (Loftus & Palmer, 1974). In this study we explore changes in the emotional experience during the reconstruction of conflict events through language-emotional reformulation. We first presented a character (f.e. "Allan is a close friend") and a description of a conflict situation ("...He hit you.")(Formulation), retold next by changing the main verb to another with higher or lower arousal ("...that's to say, Allan pushed you.")(Reformulation). Finally, we asked participants to evaluate the valence and arousal elicited by the person involved (Allan). We hypothesize that reformulation using lower arousal verbs would elicit lower arousal and more positive responses. EMG and ERP experiments are being implemented to explore the processes involved in emotional regulation through reformulation.

PS1.95. THE ROLE OF ORTHOGRAPHIC SIMILARITY BETWEEN L1 AND L2 WHEN WRITING WORDS IN L1

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Using words with some overlap (phonological and/or orthographic) between the two languages is a normal way of procedure in the bilingual and second language acquisition research. This, it is possible to study the role or the activation of one language (i.e., L1) while processing the other one (i.e., L2). Cognate words are an example: words that share form and meaning in different languages (DESERT-DESIERTO in Spanish). However, false friends are words that share formal similarity but has different meanings: ARM-ARMA (WEAPON, in Spanish). Two groups of native speakers of Spanish with different level of proficiency in English participated. They were presented English words that were cognate (CONFIRM), false friends (CONTEST) and non cognates (words with no similarity: CONVEY). Written latencies and writing durations were measured. The results support the notion that Spanish (L1) information is automatically activated when writing English (L2) words.

PS1.96. EEG INDICIES OF ATTENTIONAL CONTROL DURING AEROBIC EXERCISE

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A large body of research has suggested that the performance of cognitive tasks which involve processes governed by the executive control network may become enhanced during aerobic exercise. However, few have investigated these effects using electroencephalography. With this in mind, the present study aimed to both behaviorally and electrophysiologically explore whether aerobic exercise can modulate the performance of an attentional control task requiring both attentional selection and distractor suppression. 24 adult volunteers participated, performing an additional-singleton visual search task across three separate intensities of aerobic exercise – at rest, during low-intensity cycling, and during moderate-intensity cycling. Behavioral results indicated that moderate-intensity exercise significantly improved speed of processing in the attentional control task as compared to both low-intensity exercise and rest. However, exercise had no effect on response accuracy. Event-related potential waves associated with focal-attentional selection and distractor suppression will also be discussed.

PS1.97. CHANGING PREFERENCE: COMPARISONS OF PERCEPTUAL FLUENCY AND RESPONSE INHIBITION

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It is possible to quickly and effectively manipulate preference for objects using simple perceptual and motor tasks. Inhibition (e.g. stop-signal, and go/no-go) and perceptual-motor fluency (e.g. object motion, and reach impediment) manipulations are well studied examples of such tasks. To the authors' knowledge, these two techniques have yet to be studied together. In a series of experiments we¹ compare the effectiveness of inhibition and perceptual-motor fluency approaches,² explore the possibility of enhanced devaluation by combining these approaches, and³ vary participants' level of engagement in order to address real-world applicability.

PS1.98. ECONOMY OF ACTION: DISTRIBUTION OF THE COSTS

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When facing an environmental demand, we can use physical or social resources to reduce the cost of our actions. But when do we evaluate these resources as a benefit? In this study, we investigate this question through 2 experiments. More precisely, we investigate whether the estimation of the benefit can be modulated by a specific personality trait such as extraversion. In experiment 1, we found that the participants generally overestimated benefit provided by physical resource but the estimations weren't modulated by extraversion ($p > 0.11$). In experiment 2, we found no overestimation of the benefit provided by the social support, but the estimations were modulated by extraversion ($p < 0.01$, $\eta^2 = 0.31$). Additional analysis shows no interaction, but a main effect of extraversion and condition (all $p < 0.02$, $\eta^2 > 0.10$). Results are interpreted as a tendency of extraverts to expect more social and physical resource than introverts.

PS1.99. PREDICTIVE AND POSTDICTIVE COMPONENTS OF EXPERIENCED SELFHOOD FOR OBJECT MOVEMENTS AND THEIR RELATION TO PERFORMANCE

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Objects that we alter by our body movements tend to be incorporated to the own self in terms of experienced control over such objects (agency) and belongingness to the own body (ownership). Here we studied to which extent different spatial transformations between body movements and object movements shape such measures of selfhood as well as how they affect performance in such situations. We found that a reversal of movement directions between body movement and object movement led to a drop of experienced selfhood, as compared to a transformation that retained the movement direction of the body in the movement direction of the object. However, this drop was less pronounced when the transformation was predictable rather than unpredictable, supporting the contribution of also predictive components of selfhood experience which was also mirrored in reaction times. These results are discussed against the background of effect-based models of action control and predictive coding.

PS1.100. IN SEARCH OF RATIONALITY IN HUMAN CAUSAL LEARNING -EVIDENCE OF NON-NORMATIVE STRATEGIES WHEN COMBINING CAUSES

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Causal learning models make different assumptions about how people should combine the influence of different potential causes when presented in compound. While some models propose that the causal impact of a compound should equal the linear sum of each of the causes presented in isolation, other models suggest that the sum of the causes should be corrected by subtracting the overlap between them (i.e., people should use the noisy-or integration rule). The present series of experiments was designed to test which integration rule people use. The experiments used different cover stories, different sets of probabilities, and several presentation formats (described vs. experienced). The results of the experiments consistently differ from the predictions of the noisy-or integration rule. People do not seem to use this rule spontaneously. We discuss the implications of our results and alternative explanations for our pattern of data.

PS1.101. GRAPH-THEORETICAL ANALYSIS OF THE RELATIONSHIP BETWEEN EEG RESTING STATE AND NUMERICAL COGNITION

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One of the sources of the individual difference in numerical cognition lies in the characteristics of information processing in the brain. In the present study we tested whether brain resting state EEG activity correlates with two different mathematical tasks. We used mathematical graph theory to analyse individual differences in functional connectivity during EEG resting state (6 minutes, eyes closed) in 82 participants (aged=17-34 years, 53 women). We have found that average path length, density and modularity of brain networks were significantly correlated with maths performance. The results are discussed according to the network approach to understanding communication dynamics in brain networks and the neural efficiency hypothesis of intelligence.

PS1.102. RELATION BETWEEN DIFFERENT ATTENTIONAL DEMANDS AND DRIVING PERFORMANCE IN THE ELDERLY

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Decreased abilities of attention have been previously reported to be associated with a decline in driving performance and increased risk of accidents especially in novice drivers and older adults. To get a better understanding of specific attentional demands relevant in driving abilities, we investigated the relation between driving performance and selective attention, divided attention, vigilance, as well as switching attention between demands, switching between attributes and rules, in a sample of 93 older adults (mean age=68.29, SD=6.18years; range:60-89years). Results indicated no significant correlation between measures of attentional demands and driving performance. Findings at hand indicate that most commonly behavioral measures might not contribute to a further understanding of the underlying attentional mechanisms in driving of older adults. Because of its relevance, attention should be further investigated with more driving specific measures.

PS1.103. ALTERATION OF SUSTAINED ATTENTION IN SCHIZOPHRENIA: IS IT A CHARACTERISTIC OF THE DISORDER?

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Introduction: The alteration of sustained attention is considered a basic characteristic of schizophrenia. However, the empirical results in this regard are not conclusive. The objective of this work is to study the performance of people with schizophrenia, in an attention alert task. Method: 30 outpatients with an age range of 21-56 years participated (M = 43.12, SD = 8.09). The CPT-AX was used to evaluate the attention alert. Results: There were no significant differences in performance between the start and end of the task [t (29) = - 1.31, p > .05], nor in the errors of omission [t (29) = 1.30, p > .05] or commission [t (29) = 0.04, p > .05]. Conclusions: Despite being considered a basic characteristic of schizophrenia; sustained attention is not affected. The large number of errors indicates alterations in the processes of selection and response to stimuli, without interference of the duration of the task.

PS1.104. BINDINGS BETWEEN RESPONSES ACROSS EFFECTOR-SWITCHES

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A single encounter of a response together with a stimulus results in short lived binding between the stimulus and the response. Repetition of any part of such a stimulus-response episode can then retrieve the whole episode including the response. Recent findings show similar binding also between two successive but independently planned manual responses, indicating that binding processes play a role in the coordination of action sequences. Action coordination oftentimes includes alternation between different effector sets. Yet, switching effectors has been shown to result in very clear partitioning of actions. Thus, it is unclear whether binding of responses can generally support action. We investigated whether bindings are possible between successive hand and foot responses, i.e., across effector switches. Both response time and accuracy data indicated binding between responses, suggesting binding as a main function of action control in human behavior.

PS1.105. NO STRESS, PLEASE! INVESTIGATING THE EFFECT OF STRESS ON TRAINING AND TRANSFER EFFECTS OF A WORKING MEMORY TRAINING WITH ELEMENTARY SCHOOL CHILDREN

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An increasing number of working memory (WM) training studies still provides inconsistent results about the effectiveness. A frequent cause is the lack of appropriate control groups in intervention studies, especially in school settings. Further, many variables explaining individual differences in training and transfer effects are still unknown. For example, children's daily stress during WM trainings could be related to their training gains. Therefore, joining the debate, we conducted a complex span training task with 150 children in three groups (adaptive training, non-adaptive active control, and passive control) and assessed stress in daily life during training. We hypothesized an improvement for the adaptive group compared to both control groups and investigated near transfer effects with a non-trained WM task. Additionally, the role of daily stress for children's WM performance will be analyzed. Our aim is to enhance cognitive abilities in children and understand individual differences in the effectiveness of WM training.

PS1.106. A COMPARISON OF THE SPATIAL ARRANGEMENT AND THE PAIRWISE RATING METHOD FOR OBTAINING SIMILARITY DATA

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We compare two methods for obtaining similarity data. In the Pairwise Rating Method (PRaM), participants rate the (dis)similarity of all pairs of stimuli on a Likert scale. In the Spatial Arrangement Method (SpAM), participants organize stimuli on a computer screen so that the distance between stimuli represents their perceived dissimilarity. We had 48 participants judge the similarity of four sets of stimuli, each comprised of 16 photorealistic images, respectively from the categories birds, vegetables, vehicles, and sports. Every participant judged two sets using PRaM and two sets using SpAM. We found that SpAM takes significantly less time to complete and is participants' preferred method because they find it less tiring and more pleasant to do. However, PRaM yields more reliable data than SpAM does, meaning that PRaM requires fewer participants than SpAM to obtain representative aggregate data.

PS1.107. TO DECEIVE OR TO BE DECEIVED: THE ROLE OF "JOINT"-ACTION EXPERIENCE IN THE MOTOR MAPPING OF DECEIVING ACTIONS

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Observing deceptive actions increases motor system activation in the observers. It is unclear whether this modulation mirrors the replica of the deceptive behavior as a deceiver or the counteracting response as a deceived person. We used dual-person transcranial magnetic stimulation to measure cortico-spinal excitability (CSE) from hand and forearm muscles in pairs of participants while they predicted the weight of cubes lifted by actors performing truthful, deceptive or deceived actions. CSE was measured after a motor training consisting, for the deceiver partner, in lifting to offer a heavy or a light cube by performing deceptive actions, and, for the deceived partner, in receiving to grasp and place the object trying to resist to deception. Experiencing the role of a deceiver or a deceived person modulated CSE in an experience dependent direction, supporting the role of first-person motor (and visual experience) as crucial in the motor coding of deceptive actions.

PS1.108. MODALITY COMPATIBILITY EFFECTS OF VERBAL AND SPATIAL STIMULI

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The effects of modality compatibility have been theorised to arise from anticipation of response effects. Vocal responses are usually closely linked to not only auditory effects, but also to verbal material; hence, we assumed a stronger ideomotor connection between vocal reactions and verbal stimuli compared to spatial stimuli. We compared both visual and auditory verbal stimuli to spatial stimuli in these two modalities, requiring vocal and manual responses. Since switching between two modality-incompatible mappings is usually associated with larger costs than switching between compatible mappings, we predicted verbal stimuli would further increase those switch costs compared to spatial stimuli. Results revealed a significantly larger effect of modality incompatibility on global switch costs (mixing costs) for verbal than for spatial stimuli, however this was not the case for local trial-to-trial switch costs. This suggests verbal codes increase modality-incompatibility-based interference when two task sets have to be maintained in working memory.

PS1.109. GLOBAL NEWS – GLOBAL IDENTITY? IMPACTS OF MEDIA CONSUMPTION ON IDENTITY PERCEPTION AND ETHNOCENTRISM

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Previous research examined cognitive representation of group memberships in contact situations or under laboratory conditions. According to the Common Ingroup Identity Model, the categorization of oneself in relation to in- and outgroups can also be affected by cognitive and perceptual factors. Thus, the present research investigated whether factors beyond contact conditions were associated with the emergence of a shared identity perception and outgroup attitudes in everyday life. A correlational study examined relations between news consumption, identity perception and ethnocentrism. An experimental study examined the causal effects of priming with global respectively local news on identity perception and outgroup attitudes. Identity perception was related to media consumption. Perception of local identity mediated the relationship between local news consumption and ethnocentrism. Consumption of global news was linked to less ethnocentrism, mediated by a stronger global identity perception. Unexpectedly, the causal effects of priming on identity perception or ethnocentrism were not reliable.

PS1.110. THE IMPACT OF MUSICAL PRACTICE ON ATTENTIONAL NETWORKS AND VIGILANCE

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Recent evidence suggests that musical practice could be a promising cognitive enhancer. Attention is one of the functions that could be improved since playing an instrument involves different attentional demands. However, previous works show some inconsistent results for certain attentional processes (selective attention, executive control, and vigilance), suggesting that only some processes could be improved. The aim of the current study was to investigate the effects of musical experiences on attention with a fine-grained measure (ANTI-Vea). This task allows measuring the three Posner and Petersen's networks (Alerting, Orienting, and Executive control) as well as two different components of vigilance (Executive and Arousal Vigilance). Adult musicians (18-35 years) showed benefits in processing speed and in the two components of Vigilance, in comparison with a group of non-musicians matched with Propensity Score Matching in an extensive set of variables. It supports the possibility of specific effects of musical practice on attention.

PS1.111. CONSOLIDATION OF NOVEL WORDS INTO SEMANTIC MEMORY: THE ROLE OF CONTEXT

Mak, M.H.C. & Nation, K.

University of Oxford, UK

Previous studies showed that newly learnt words require sleep-related consolidation before they can interact with pre-existing words (e.g., competition). Our study investigated whether contextual diversity and contextual familiarity influence the time-course with which newly learnt words acquire the ability to interact with known words. In Experiment 1, 45 participants learnt novel words (banasa) in the context of a repeated or changing background object. In Experiment 2, 47 participants learnt the words in the context of a familiar or unfamiliar background object. If these words can interact with known words, the processing of known words (banana) should be interfered. The two experiments demonstrated that when learnt in a repeated and familiar context, the novel words can interfere with the known words immediately after learning, even without sleep-related consolidation. Our study suggests that such contexts help new words establish more reliable connections with pre-existing nodes in semantic networks, thereby facilitating integration.

PS1.112. IMPACT OF TEACHING METHODS FOR READING ON NEURAL TUNING TO WORDS IN YOUNG POOR READERS
Lochy, A.¹, van de Walle de Ghelcke, A.², Rossion, B.^{2,3}, & Schiltz, C.¹

1 *Université du Luxembourg, Luxembourg*; 2 *Université Catholique de Louvain, Belgium*; 3 *Université de Lorraine, France*

The impact of teaching methods on the left hemispheric (LH) specialization for reading in children remains unknown. We tested 42 first graders (mean age: 6.08 years) from schools using both a phonic and a global method in parallel, behaviorally and with Fast Periodic Visual Stimulation using electroencephalography. 40-sec strings of pseudofonts were displayed at 6Hz, in which were periodically displayed (1.2Hz) either words taught at school with whole-word form rote-learning (global method) or control pseudowords eliciting grapheme-phoneme mappings (phonic method). Control pseudowords elicited LH responses whatever the reading ability. For global words, a difference emerged as a function of group: in good and average readers, responses were stronger in the LH, while in poor readers, global words elicited an atypical bilateral neural pattern due to reduced response amplitude in the LH. These results suggest that difficulties in automatizing GP mappings induce reliance on an alternative visual strategy when available.

PS1.113. L1 INFLUENCE IN L2 GENDER PREDICTIONS: A VISUAL WORLD STUDY

Lago, S. & Stone, K.
University of Potsdam

Current evidence suggests that native and non-native speakers differ in their ability to predict upcoming words. For example, when hearing a feminine gender-marked determiner in Spanish, English non-native speakers of Spanish take longer than Spanish native speakers to look at feminine objects on a visual display. Our study asks whether this delay is unavoidable in a non-native language or whether it depends on whether speakers' native and non-native languages encode gender similarly. We used visual world eye-tracking to examine whether listeners used gender marking on German determiners and possessive pronouns to make predictions. We compared non-native speakers of English (which does not encode gender in determiners/pronouns) and Spanish (which does). The timecourse of listeners' eye-movements suggested that both groups used gender predictively, but the effect was stronger in Spanish than English speakers. These findings suggest that predictive skills depend on speakers' native language and the grammatical constructions under study.

PS1.114. ACTING AND REACTING: IS INTENTIONAL BINDING DUE TO SENSE OF AGENCY OR TO TEMPORAL EXPECTANCY?

Ruess, M., Thomaschke, R., & Kiesel, A.
Albert-Ludwigs-Universität Freiburg, Germany

We perceive effects caused by an action earlier compared to stimuli not caused by an action. Although this phenomenon (Intentional Binding; IB) has been investigated in numerous studies, the underlying mechanisms are not yet clear. We investigated whether IB is based on Sense of Agency, or on temporal expectancy, by comparing how delay duration and duration predictability influence IB, Sense of Agency, and temporal expectancy. The influence of delay duration was similar for IB and Sense of Agency with a decrease of both measures for longer delay durations, whereas temporal expectancy increased for longer delay durations. However, an influence of duration predictability in terms of an interaction of delay duration and duration predictability became significant only for Sense of Agency and temporal expectancy. IB did not correlate with Sense of Agency and temporal expectancy. The result pattern indicates IB to be rather driven by Sense of Agency than by temporal expectancy.

PS1.115. ELECTRODERMAL FINGERPRINT - CONSISTENCY ACROSS TIME

Zimonyi, S., Gönye, B., Kotyuk, E., & Szekely, A.
ELTE Eötvös Loránd University

It is considered a fact that individuals have unique electrodermal activity (EDA) patterns of their own. But there is not much empirical evidence for EDA consistency across time and tasks. Can patterns be considered a trait? EDA consistency across time was measured three times from 67 university students while listening to lectures. Consistency across different tasks was assessed using EDA data from 156 students. Our results show that EDA levels of participants were highly consistent. Correlation for short measurements one hour apart was high ($r=.773$), while those one-week apart the relationship was moderate ($r=.392$). We also observed task-independent EDA reactions: EDA levels during Stroop-task and relaxation were similar ($r=.495$). Interestingly, no association of EDA levels and personality traits or impulsivity was found. We conclude that electrodermal activity can be considered a trait and propose that more detailed analyses of EDA patterns are needed for characterizing the "EDA fingerprint".

PS1.116. LONG-TERM MEMORY EFFECTS IN WORKING MEMORY ARE NOT ALWAYS AUTOMATIC: EVIDENCE FROM THE IMAGEABILITY EFFECT

Kowialiewski, B.^{1,2}, Van Akelyen, D.¹, & Majerus, S.^{1,2}

1 University of Liège, Liège, Belgium; 2 Fund for Scientific Research, F.R.S.-FNRS, Brussels, Belgium

Verbal working memory (WM) is influenced by linguistic knowledge; this influence is considered to reflect non-strategic linguistic activation during WM. This may however not be true for the influence of semantic knowledge as involved in the imageability effect (recall of high vs. low imageability words). We assessed the role of controlled processes such as semantic elaboration in the occurrence of the imageability effect. Sixty participants recalled six-item lists composed of high or low imageability words, with an interfering task presented during encoding for half of trials. The interfering task either involved semantic judgment supposed to prevent semantic elaboration processes, or similarly demanding visuo-spatial judgement processes. We observed robust evidence for a reduced word imageability effect in the semantic but not in the visuo-spatial interfering condition. These results suggest that the occurrence of the imageability effect in WM tasks relies partially on semantic elaboration strategies.

PS1.117. THE FLEXIBILITY OF TIME-ON-SPACE INTERFERENCE: THE ROLE OF SPATIAL SALIENCY AND INTERINDIVIDUAL DIFFERENCES

Vidaud-Laperriere, K. & Charras, P.

Université Paul Valéry Montpellier II

Explicit temporal estimations are influenced by the spatial characteristics of the stimuli, and conversely, spatial estimations, such as distance, are modulated by temporal context. Thereby, the ATOM theory suggests the existence of a general magnitude system for representing and estimating spatial and temporal magnitudes (Walsh, 2003). In contrast, the Metaphor theory advocates a leading role for the spatial context in magnitude estimations (Casasanto et al., 2008; 2010). One of the main arguments relies on the scarcity of the time-on-space influence. We conducted two experiments to investigate time-space interference. By manipulating distance saliency, we show in Experiment 1 that time can drastically modulate spatial estimates, and to a larger extent than the space-on-time effect. Additionally, Experiment 2 shows that time-on-space interference depends on expertise in both the spatial and temporal tasks, while space-on-time interference did not. The results are discussed in terms of acuity and of gradient of automaticity.

PS1.118. QUANTIFYING LIST-WISE AND CATEGORY-WISE CLUSTERING IN FREE RECALL - AN UPDATED COMPARATIVE OVERVIEW

Englert, J.¹, & Augustin, M.²

1 Westfälische Wilhelms-Universität Münster; 2 Saarland University

The adjacent reproduction or “clustering” of related material in free recall is thought to reflect the organizational structure of memory. While several measures of clustering exist, recent overviews and comparisons are lacking. We compare several indices differing with regard to the assumptions they make about underlying distributions, as well as the factors they account for, such as chance clustering, category number, and list length. Importantly, we distinguish between list-wise and category-wise measures. The latter allow for comparisons between different categories in the same output list, as is often of interest in within-subject designs, or when testing for asymmetries between semantic categories. The reviewed measures include the MRR, the ARC and its within-list extension, the CLT and the CPDIFF. Based on computational simulations, we report correlations between different clustering measures, as well as their susceptibility to variations in underlying distribution, list length, number of categories, and imbalances in category size.

PS1.119. THE ROLE OF RESPONSE CODES IN SPATIAL-NUMERICAL ASSOCIATIONS

Sixtus, E. & Werner, K.

University of Potsdam, Germany

Numbers are thought to be mentally represented on a mental number line running horizontally from left to right (for Western cultures) or vertically from bottom to top for small to large numbers. We conducted three experiments with the same group of participants which tested for 1) conceptual spatial-numerical associations (SNAs) in a Go/No-go setup including only one central response button, 2) SNAs in combination with alternating response codes (SNARC) including horizontally and vertically aligned response buttons, and 3) a rather conventional horizontal SNARC effect. Preliminary analyses suggest that setups with horizontally distributed response buttons (Experiment 3) strongly prime the given dimension while alternated priming along different axes (Experiment 2) does not. We compare individual conceptual horizontal and vertical SNAs with individual spatially primed horizontal and vertical SNARC effects. Overall, our preliminary results suggest that SNAs are highly malleable by situational factors.

PS1.120. SOME WORDS ARE JUST HARD TO LEARN: ERP RE-SEARCH SHOWS SHALLOWER SEMANTIC ENCODING FOR NON-NATIVE THAN FOR NATIVE WORDS

Marecka, M.¹, McDonald, A.², Madden, G.², & Fosker, T.²
1 Jagiellonian University, Poland; 2 Queen's University Belfast, UK

It is established that spoken word forms in a second language are processed more efficiently and learned better when they resemble those of a learner's first language in sound structure or accent. We used ERPs to examine if the meanings of words are also encoded better when the words are more native-like. Seventeen participants learned novel words paired with abstract shapes in a paired associates task. Novel words varied systematically in how native-like their phonological structure and/or accent were. Participants also performed a word recognition task where they heard one of the learned words paired with a matching or non-matching shape. Accuracy, RTs and ERPs in response to the matching and mismatching shapes were measured. Both non-native structure and accent slowed the rate of word learning. Words with non-native phonological structure elicited a smaller N300 than words with a native phonological structure. This suggests shallower semantic encoding for non-native-like nonwords.

PS1.121. WORKING MEMORY AND CUE COMPETITION IN SENTENCE READING

Togato, G.¹, Macizo, P.^{2,3}
1 Pennsylvania State University, USA; 2 University of Granada, Spain; 3 Mind, Brain and Behavior Research Center (CIMCYC), Spain

We evaluated validity, preference and competition of two syntactic cues in Spanish (subject-verb agreement and animacy) and the role of working memory (WM) during cue competition in sentence reading. Spanish participants read noun-verb-noun (NVN) sentences and performed an agent assignment task. Experiment 1 revealed that readers preferred as agent of the sentence (a) the noun that agreed with the verb and (b) the animated noun over the inanimate noun. The subject-verb agreement cue was preferred over animacy. Cue competition arose in reading: longer reading times were observed for sentences in which subject-verb agreement and animacy guided towards different interpretations. Experiment 2 revealed that the use of syntactic cues depended on WM capacity. High WM span readers made use of lexical-semantic information (animacy) and did not show the interference associated with cue competition. Low WM span readers preferred the favorite cue in Spanish (subject-verb agreement) and showed interference when cues competed.

PS1.122. PREDICTORS OF THE PERFORMANCE ON PROSPECTIVE MEMORY TASKS

Wójcik, M. & Niedźwieńska, A.
Jagiellonian University in Cracow (JU), Poland

Prospective memory is remembering to perform intended actions at a specific moment in the future. We investigated what types of prospective memory tasks are formulated on a daily basis and what factors influence how effectively these tasks are completed. Participants (N=120) provided their individual intentions each day for 5 five days and the intention completion was evaluated every day. The results show that the majority of individual intentions had a form of time-based prospective memory tasks which require more attentional and strategic cognitive resources, compared to other types of prospective memory tasks. Furthermore, the more engrossed in everyday activities the individual was and the less routinised their everyday life was, the lower level of prospective memory performance they achieved. Less routines means less opportunities for a detailed planning (i.e. connecting intentions to repeatedly occurring events and actions) and thus more resources that need to be devoted to prospective memory tasks.

PS1.123. DECODING THE TEMPORAL DYNAMICS OF COVERT SPATIAL ATTENTION USING MULTIVARIATE EEG ANALYSIS: CONTRIBUTIONS OF RAW AMPLITUDE AND ALPHA POWER

Desantis, A.^{1,2}, Chan Hon Tong, A.¹, Collins, T.², Hogendoorn, H.^{3,4}, & Cavanagh, P.^{2,5,6}

1 Office National d'Etudes et de Recherches Aéropatiales (ONERA), France; 2 Centre National de la Recherche Scientifique (CNRS) & Université Paris Descartes, France; 3 The University of Melbourne, Australia; 4 Utrecht University, The Netherlands; 5 Dartmouth College, USA; 6 Glendon College, Canada

We investigated whether EEG event related potentials and alpha oscillations can decode the orientation of covert attention over time. Observers fixated a central point while two Random Dot Displays (RDDs) were presented one to the left and one to the right of fixation. In cued trials, an arrow, flashed at fixation, indicated the RDD where coherent motion would appear. In neutral trials, a neutral cue was presented that contained no information regarding the location of coherent motion. Participants reported whether the dots moved upward or downward. Multivariate classification showed that both alpha power and raw voltage could predict the orientation of attention before participants' response. Decoding accuracy was superior

with alpha power compared to raw electrode traces. For both signals decoding performance was driven by the activity at parieto-occipital channels. In conclusion, cortical processes associated with spatial attention can be tracked over time from EEG signals.

Poster session 2

Espejos Hall

Friday 27th
11:40-13:10

PS2.1. MNEMONIC EMOTION REGULATION: POSSIBILITIES AND LIMITATIONS

Nørby, S.

Aarhus University, Denmark

Emotion regulation encompasses attempts to control the experience and expression of emotions. Such regulation may be based on or target memories capable of evoking emotions. Specifically, it is proposed that mnemonic emotion regulation comprises attempts to increase access to (e.g., rehearse), decrease access to (e.g., suppress) or alter the characteristics of (e.g., reappraise) certain memories based on emotion regulation motives (e.g., hedonic goals). Mnemonic emotion regulation may have immediate and momentary effects, for example when an individual selectively retrieves positive self-affirming memories to improve the current mood. However, it may also involve learning and influence emotional well-being enduringly, for example when it makes positive long-term memories easily accessible and salient. The proposed conceptualization of mnemonic emotion regulation is integrated with existing theories about emotion regulation and autobiographical memory. Also, factors that enable (e.g., efficient executive functions) and impede (e.g., high arousal) mnemonic emotion regulation are considered.

PS2.2. LEARNING NEW CONCEPTS IN MATHEMATICS: PERFORMANCE AND INTROSPECTIVE ASPECTS

Barot, C.¹ & Izard, V.²

1 Institut Neurosciences Cognition, Paris Descartes, (INC), France; 2 Université Paris Descartes, Sorbonne Paris Cité, France; 3 Centre National de la recherche scientifique, (CNRS), France

Concept learning has been described as a gradual process. However, learners sometimes report experiencing sudden “insights”, suggesting that they may lack introspective access to their learning process. Indeed, previous research has shown that learning can occur without awareness, such as when people are occupied on distractor tasks, or when they sleep. Using the mathematical notion of geodesic as a model situation, we measured both objective

learning and introspection across five conditions, manipulating the amount of learning material given to participants (zero to seven illustrated texts). At post-test, participants showed better performance when they had been given more texts to study, and they also reported understanding the target concept better. Participants reported experiencing sudden learning episodes (insights). However, we did not detect the presence of subjective bursts of learning in participants’ ratings of the helpfulness of the successive study texts. Our findings show that insights may occur while introspection remains accurate.

PS2.3. SUPRALIMINAL BUT NOT SUBLIMINAL ODORS MODULATE MOTOR RESPONSE INHIBITION

Albayay, J.¹, Castiello, U.¹, & Parma, V.^{2,3,4}

1 University of Padova, Italy; 2 Instituto Superior de Psicologia Aplicada, Portugal; 3 Karolinska Institutet, Sweden; 4 International School for Advanced Studies, Italy

Background: Affective stimuli interfere with motor response inhibition due to an attentional prioritization of emotional information. In the go/no-go task, this prioritization emerges as higher rates of commission errors (CEs) and faster RTs. Would odors, stimuli usually processed outside of conscious awareness, suffice to induce response inhibition? Method: Thirty-four participants performed a go/no-go task including odor primes. A pleasant odor (orange) and an unpleasant odor (trimethyloxazole) were presented at individually-determined supra- and sub-threshold levels. Clean air was presented as a control condition. Linear and generalized mixed-effects models were computed to assess RTs and CEs. Results: RTs were faster when exposed to an odor as compared to clean air, regardless of odor threshold. More CEs were elicited by subliminal (vs. supraliminal) odors and by supraliminal pleasant primes (vs. clean air). These findings extend the previous literature on the impact of affective stimuli and consciousness on response inhibition to the olfactory domain.

PS2.4. SAILIENT ITEMS INTRUDE IN VISUAL WORKING MEMORY

Tanabe-Ishibashi, A., Ishibashi, R., & Hatori, Y.
Tohoku University, Japan

One of the important functions of the working memory system is inhibition of task-irrelevant information because the irrelevant information may consume the limited cognitive resource. The rate of "intrusion errors" in working memory tasks is often used as an index of the inhibitory function. An intrusion error means false recall/recognition of an item which was presented with the target simultaneously but was not required to encode. We investigated whether intrusion errors are caused by task-irrelevant items that occupy the attentional resource. To examine the effect of such items in a visual working memory task we calculated saliency of each item and conducted a logistic mixed-effect model analysis. The results indicate that items with high saliency significantly tended to cause intrusion errors. It suggests that intrusion errors in visual working memory is caused by a failure to allocate attention for task-relevant information.

PS2.5. LEXICAL COMPETITION IS NOT DEPENDENT ON PICTURE FAMILIARIZATION: EVIDENCE FROM CODEABILITY EFFECTS.

Melinger, A.
University of Dundee, UK

Recently, Gauvin et al. (2018) demonstrated that semantic interference in the picture-word interference paradigm (PWI) depends on the familiarization phase of the experiment. They suggested that familiarization primes the exogenously-activated competitors (e.g., lion – tiger), raising their activation level over a competition threshold. Codeability effects, namely the observation that pictures with more than one label are named more slowly than pictures with a single label, also arise from lexical competition, but competition between endogenously-activated competitors. Across 3 experiments, we investigated the role of familiarization and priming to endogenous competition. Participants named high-codeability (e.g., bed) and low-codeability (e.g., sofa – couch) pictures and were either familiarized with the pictures and their target labels or were allowed to name pictures freely. While familiarization sped naming times overall, the codeability effect persisted, suggesting that endogenous competition cannot be squashed or moderated by instruction or priming.

PS2.6. THE ACUTE EFFECTS OF COCOA FLAVANOLS ON VISUAL WORKING MEMORY

Altinok, A., Karabay, A., & Akyurek, E.G.
The University of Groningen, The Netherlands

Consumption of cocoa flavanols may have beneficial physiological effects on the brain due to their ability to activate nitric oxide synthesis. Nitric oxide mediates vasodilation, increasing cerebral blood flow, and can also act as a neurotransmitter. However, the cognitive consequences of cocoa flavanols remain underspecified. The aim of this study was to examine whether cocoa flavanols influence visual working memory (WM). We conducted two randomised, within-subjects, placebo controlled, double-blind experiments on normal healthy adult volunteers (N=48 and N=36, gender-balanced). In the first experiment, we measured passive maintenance of grating orientations in WM, whereas in the second experiment we measured active updating of WM (rotation). Precision and guess rates were analysed with MemToolBox. The results suggested that passive maintenance in visual WM is not enhanced by cocoa flavanols, possibly because it relies on activity-silent (synaptic) mechanisms. By contrast, preliminary results indicate that active updating of WM is affected by cocoa flavanols.

PS2.7. WAITING FOR THE RIGHT MOMENT: WHEN DO INDIVIDUALS OVERLAP THEIR PROCESSING IN TASK SWITCHING WITH PREVIEW?

Bruening, J. & Manzey, D.
Technische Universität Berlin (TUB), Germany

Studies on cognitive styles in multitasking have shown that individuals prefer to process two tasks in either a serial or an overlapping manner. Cognitive styles can be identified when individuals are provided with a preview of the next task switch stimulus in a predictable task switching procedure as in the task switching with preview (TSWP) paradigm. Whereas it seems clear that serial processing involves continuous task shielding throughout the entire performance, it is unknown when overlapping processing takes place. In our ongoing data collection, we test n=45 participants with the TSWP paradigm. Onset and therefore length of the preview is varied within-subject. This allows to disentangle whether the overlapping processing of the preview stimulus¹ occurs contingent upon the onset of a task stimulus of the performed task or² depending on the length of the preview, i.e., whether individuals choose a suitable time while still performing the ongoing task).

PS2.8. TEMPORAL AND SPATIAL DYNAMICS OF STROOP TASK

Shichel, I.^{1,2} & Tzelgov, J.^{2,3}

1 University of Haifa; 2 Ben-Gurion University of the Negev; 3 Sapir Academic College

Task conflict (TC), Semantic conflict (SC), and Response conflict (RC) are three independent components of the Stroop task (Shichel & Tzelgov, 2018). We measured the contributions of these components to the effect and manipulated the neutrals to color-words ratio, which is a marker of applying control. We used mouse-tracking to examine the temporal and spatial dynamics of the three conflicts and their controllability. We assumed that initiation-time reflects an early processing stage (TC), while movement-time and mouse curvatures reflect later processing stages (SC and RC). During initiation-time, only TC and SC contributed to the Stroop effect. During movement-time, all three conflicts contributed to the Stroop effect. Only RC and SC contributed to the effect in mouse curvatures. TC and SC, but not RC, were modulated by manipulating the neutrals to color-words ratio during movement-time. This demonstrates the different contribution of these components during different processing stages.

PS2.9. EARLY BILINGUALISM BOOSTS READING DEVELOPMENT THROUGH STRONGER INTERHEMISPHERIC TRANSFER MEASURED VIA DICHOTIC LISTENING

Pérez-Navarro, J.¹, Ordin, M.^{1,2}, Lallier, M.¹

1 Basque Center on Cognition Brain and Language; 2 Ikerbasque, Basque Foundation for Science

It has been suggested that bilingual individuals have stronger inter-hemispheric communication than monolinguals whilst performing language dichotic listening tasks. Interestingly, efficient right-to-left inter-hemispheric transfer on the dichotic listening paradigm (i.e., high left ear performance) has been suggested to be related to efficient reading and phonological skills. We measured reading and phonological awareness skills of 60 Grade 1 children and showed that bilinguals had higher left ear report performance than monolinguals. Also, children with better reading skills were those with better left ear report performance. Longitudinal analyses showed that better left ear dichotic performance at the beginning of Grade 1 was related to better reading performance one year and a half later at the end of Grade 2. Overall, our data suggests that the early use of languages "bilingually" might boost right-to-left inter-hemispheric transfer, potentially enhancing left ear dichotic listening performance that predicts future reading abilities.

PS2.9. LINKS BETWEEN MATH ANXIETY AND PROFESSION PREFERENCES: A DEVELOPMENTAL STUDY

Rubinsten, O., Fares, L., & Eidlin-Levy, H.
The University of Haifa, Israel

A strong background in mathematics is critical for many career opportunities in today's increasingly technological society. The current longitudinal study aimed at investigating how career preferences are affected by math anxiety and by mathematics performance, and how this association develops over time with increasing social and pedagogical demands. Ninth graders, with varying levels of mathematical abilities, answered math and trait anxiety questionnaires as well as occupational preferences questionnaire. The professions in the occupational questionnaire, had varying and known levels of mathematicity load. The students were followed up in a longitudinal manner during the consecutive year, after the shift from middle to high-school, and with increasing demands towards the final exams. Results showed that math anxiety and math performance were significantly associated with professional preference in middle school. In high school, this connection was more prominent. These findings raise awareness to the detrimental effects of math anxiety on future career choices.

PS2.11. EYE GAZES REVEAL THE TIME COURSE OF ANALOGICAL MAPPING IN GEOMETRIC ANALOGIES

Krocze, B., Ciechanowska, I., & Chuderski, A.
Jagiellonian University in Krakow, Poland

Analogy underpins various cognitive processes, from perception, to learning, categorization, and reasoning. The time course of analogical mapping – finding relational match shared by two analogous situations – was examined. In a new geometric A:B::C:D? task pattern D had to be generated from pattern C according to the same transformations that generated pattern B from pattern A. Response options differed systematically in the number of correct transformations, from no transformation via partial match to the full relational match. Eye fixations and pupil sizes predicted 65% of the variance in the relational match of the options selected. The correct options were chosen only if fixated on for a sufficiently long time. The average match of fixated options increased monotonically over the entire course of an analogy trial. All these results suggest that analogical mapping adds consecutive elements gradually to the initial, incomplete representation of analogy. Mapping needs time to unfold.

PS2.12. TASK TYPES MAKE CROSSMODAL CORRESPONDENCES APPEAR ABSOLUTE OR RELATIVE

Brunetti, R.¹, Santangelo, V.^{2,3}, Del Gatto, C.,¹ & Indraco, A.¹

1 *Università Europea di Roma, Rome, Italy*; 2 *University of Perugia, Perugia, Italy*; 3 *Santa Lucia Foundation, Rome, Italy*

Some kind of Crossmodal Correspondences, such as the Pitch/Size one, have been shown to be relative in nature and subject to a trial-by-trial interpretation. In 3 experiments our aim is to verify whether this relativity is boundless or it works within some kind of limit. In Experiments 1 and 2, participants had to focus both on visual and auditory stimuli. Their task was to adjust the disc size (or pitch) according to a given pitch (or disc size). In Experiment 3, participants had to perform a speeded classification of disc size, while the concurring pitches were task-irrelevant. Pitches were manipulated to check whether the boundaries found in the first experiments would affect the congruence effect. Results show a significant effect of the task over the correspondence - the effect appears to link sensory dimensions more absolutely or relatively according to which and how many dimensions the attention is focused on.

PS2.13. THE LABELING BENEFIT IN VISUAL WORKING MEMORY: HOW SPECIFIC DO LABELS NEED TO BE?

Overkott, C., Matyja, M., & Souza, A.S.
University of Zurich, Switzerland

Describing our visual experiences improves their retention in visual working memory, yielding a labeling benefit. Descriptions vary, however, in specificity from very broad to very narrow. Does the degree of specificity constrain the labeling benefit? The present study addressed this question by varying the number of terms used to describe colors. Participants memorized four sequentially presented colors, and later reproduced each of them using a color wheel. During color presentation, participants articulated "bababa", thereby preventing verbal labeling (0-label); or they labeled the colors with two, four, or any term they wanted (2-labels, 4-labels, and 7+labels condition, respectively). The error in reproducing the colors decreased monotonically with increases in the number of labels used. Mixture modeling showed that labeling increased the quantity of colors stored in mind. Increases in memory precision, however, depended on the label specificity: broad labels reduced precision compared to no-labels, whereas more specific labels increased representation precision.

PS2.14. A CROSS-LINGUISTIC STUDY ON THE LEXICAL PROCESS ACQUISITION ACROSS TWO LANGUAGES WITH A DIFFERENT ORTHOGRAPHIC DEPTH: ITALIAN AND FRENCH.

De Simone, E.^{1,2}, Mulatti, C.³, Uccula, A.⁴, Schmalz, X.^{1,2}.
1 *Università degli Studi di Padova, Italy*; 2 *Ludwig-Maximilians-Universität München, Germany*; 3 *Università di Trento, Italy*; 4 *Università degli Studi di Sassari, Italy*

In predictable transparent orthographies readers can mostly recognise words by converting graphemes into phonemes, while in unpredictable deep orthographies readers often need to recognise the word as a whole. This should lead to an overall shift in the relative reliance on sublexical and lexical processes (Katz & Frost, 1992). We aimed to test this hypothesis, originally developed to explain adult data, with French and Italian-speaking children. Lexical processing efficiency was tested with the baseword frequency effect in a pseudoword reading aloud task: we created pseudowords by exchanging a single letter of real words, which were cognates in French and Italian and were chosen to vary in frequency. If French children rely more on lexical processing, the interference associated with baseword frequency should be stronger compared to Italian children. We found an effect of baseword frequency ($p < .001$), but the interaction between languages and frequency was not significant ($p = 0.457$).

PS2.15. EMBODIMENT EFFECT ON THE COMPREHENSION OF MANDARIN MANUAL ACTION LANGUAGE IN L2: AN ERP STUDY

Zang, A.¹, Wang, H.², Guo, H.², Wang, Y.³, Beltrán, D.¹, García-Marco, E.^{1,6}, de Vega, M.¹

1 *Universidad de La Laguna, Spain*; 2 *Dalian University of Technology, China*; 3 *Dongbei University of Finance & Economic, China*; 4 *Universidad Nacional de Educación a Distancia, Spain*

Previous researches performed in monolinguals indicated that it is more difficult to understand motor incompatibility compared to motor compatibility, which attributed to embodied constraints exists in sensory-motor knowledge affecting the comprehension of action language. This study investigates the embodied effects in comprehending L2 Mandarin manual action language with ERP technique. The larger N200 and P600 in the compatible condition are ascribed to the stronger embodiment effect in the compatible condition, because it is easier to simulate the manual actions in the compatible condition, activating the correspondent L1 manual actions to compete the cognitive resource with L2, thus inducing stronger cognitive control effect. This result demonstrated that L2 comprehenders do not activate embodiment effect to the same extent as L1 comprehenders. Also, L2 needs to suppress L1 from

competing the cognitive resources. The research further extends embodiment effects on the comprehension of manual language in L2.

PS2.16. BRAIN NETWORKS OF ATTENTION AND PARA-FOVEAL PERCEPTION DURING READING

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During reading, more than one word usually reaches the sensory receptors simultaneously. In an fMRI experiment, participants read sentences word by word at fixation. Sentences were presented in three different experimental conditions: 1) words without flankers, 2) words flanked by symbols, and 3) words flanked by other words (on its right by the next word in the sentence and on its left by the preceding word or the next word of the sentence on the left and the preceding word on the right). Metabolic measures showed an increase of the BOLD signal in the no-flanker condition in respect to the flanker conditions, at posterior parietal and occipital areas of the cortex. The activation in these areas increases when no flankers are presented, probably showing the inhibition of a default visual-attention mode during reading that involves parafoveal processing.

PS2.17. CUE INTEGRATION STRATEGY FOR SELF-OTHER SENSORY ATTRIBUTION IN MOTOR CONTROL

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Feedback control is driven by the self-attribution of sensations. This self-other sensory attribution can be achieved through the integration of sensorimotor cues, including prediction error of movement, and cognitive cues such as knowledge or beliefs; however, the cue integration strategy in motor control is unclear. In a motor-control task, participants had to control only the cursor of self-movement by utilizing the spatiotemporal consistency (sensorimotor cue) between the actual and cursor movements without using the cursor appearances (cognitive cue). Experiments 1 and 2 revealed that self-other attribution was affected by the cognitive cue when the sensorimotor cue was less reliable due to flickering of the cursor at 8 Hz. However, in Experiment 3, where the cursor was flickering at 4 Hz, only the effect of the sensorimotor cue was seen. In motor control, the cognitive cue might have a compensatory function on self-other attribution grounded within the sensorimotor cue.

PS2.18. WHO WAS IT? – CULTURAL INFLUENCES ON THE USE OF SENSE OF AGENCY CUES

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Sense of agency (SoA) is the sense of control over one's own actions and the corresponding effects. We examined whether agency cues (action-effect congruency, affective valence of the effect, and temporal occurrence of the effect) differ between Asian (Mongolia) and Western (Austria) cultures. Participants first learned to associate actions with positive and negative effects. Then participants performed the same actions and after different intervals positive and negative effects, which were congruent or incongruent with the acquired action-effect associations, were presented. Participants rated how likely they caused the effect (SoA-ratings). Higher SoA-ratings for congruent compared to incongruent effects, and for positive compared to negative effects, indicated that action-effect congruency and affective valence modulate SoA in both cultures. SoA-ratings decreased with increasing interval in Austrians only, indicating that Mongolians might not use the temporal occurrence of the effect as an agency cue. Thus, the use of some agency cues might be culture-dependent.

PS2.19. AUTONOMIC AROUSAL IN LIVE EYE CONTACT AND IN VIDEO CALL

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Eye contact increases autonomic arousal. This effect has been found only with mutual, live eye contact, and not in response to direct gaze images or videos, or when observers believe that the other person cannot see them. We examined whether seeing another's direct versus averted gaze has similar effects in a bidirectional video call and in a live condition. In both conditions, participants knew that the other person was able to see them. These conditions were also compared to seeing a mere video of another person. The results showed that, in the live and video call conditions, direct gaze significantly increased autonomic arousal (skin conductance) in comparison to averted gaze. In the mere video condition, however, gaze direction had no effect on autonomic arousal. Therefore, the belief of being seen seems to be essential for the psychophysiological effects of eye contact.

PS2.20. VISITING YOUR COUNTRY OF ORIGIN: IMPACT OF RECENT RE-IMMERSION TO A HOME COUNTRY ON NATIVE LANGUAGE LEXICAL ACCESS

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To investigate how recent language re-exposure influences access to the native language, we explored picture naming performance of Polish immigrants living in the United Kingdom before and after a short-term visit to their home country. Response latencies and ERPs were recorded while participants named pictures in L1.

We predicted that after recent re-exposure to L1 environment, participants would be faster to produce L1, as well as demonstrate reduced amplitude of N300 suggesting easier word retrieval. As predicted, the results showed faster response times after L1 re-exposure indicating that recent immersion in a native language environment improves word retrieval in that language. However, contrary to our predictions, N300 amplitude was higher in the condition after the recent native language re-exposure. We discuss the results in the context of previous findings on the N300 component as well as of the impact of prior language context on language production.

PS2.21. MASKED MORPHOLOGICAL PRIMING IN GRADE 3 CHILDREN: ORTHOGRAPHIC AND PHONOLOGICAL CONTRIBUTIONS

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Numerous masked priming studies suggest that morphologically complex words are segmented into their constituent morphemes during word recognition. Two lexical decision experiments examine why, in young readers, morphological priming emerges only when the relation between the root of the word prime and the target word is phonologically transparent. Pseudoword primes (60 ms) were used to contrast two different accounts: weaker lexical connections between morphologically related but phonologically opaque words, and prelexical phonological recording of the letter strings. In Experiment 1, the phonological relationship between the root of the prime and the target was either transparent (cerisage-CERISE) or opaque (raisineur-RAISIN). In grade 3 children, priming occurred for transparent relationships only. In Experiment 2, the root morpheme of the prime was a pseudohomophone of the target word (brocette-BROSSE). No priming effect was

observed. Together the findings indicate that morphological priming in young readers is influenced by both orthographic and phonological processing.

PS2.22. THE INFLUENCE OF MUSICAL EXPERTISE IN COGNITIVE CONTROL: AN APPROACH FROM THE DUAL MECHANISMS FRAMEWORK

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The current work aimed to explore the effect of musical training in different executive functions. Previous studies have mainly focused on isolated executive control mechanisms ignoring the critical interactions between them (e.g., proactive and reactive control). We addressed this issue in two different studies by comparing professional musical students and students with no musical experience in different cognitive skills, such as inhibitory control (Experiments 1 & 2) and working memory (Experiment 2). Critically, participants in both studies also performed a task that required continuous adaptation and coordination of proactive and reactive control strategies (AX-CPT). The results showed that groups were equivalent in inhibitory control. However, musicians were more efficient than controls at coordinating proactive and reactive control, which speaks in favor of their higher cognitive flexibility.

PS2.23. FLUCTUATIONS IN ERROR-MONITORING AND ERROR AWARENESS DURING FLANKER AND STROOP TASKS ONE WEEK APART

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We continually monitor and re-adjust our cognitive system when necessary. In this process, response conflict detection is thought to play a key role as indexed by the error-related negativity (ERN) occurring immediately after an incorrect response. By contrast, error awareness is reflected in the error positivity (Pe) between 200 and 500 ms. It remains open whether these components change as a function of task or time. Here, we investigated whether the ERN/Pe and performance in a Stroop and Flanker task, consisting of 160 congruent and incongruent trials, are modulated within one week. Largely stable behavioral performance showed considerable individual differences, in particular in terms of response accuracy. Each task showed only subtle differences between sessions. Notably, task specific effects on ERN and Pe amplitudes were evident, suggesting that partly dissociable cognitive processes underlie error-related brain activity. The results highlight

intra-individual stability on error monitoring over time and task-dependent inter-individual differences.

PS2.24. A LEFT EAR ADVANTAGE FOR STRESS PROCESSING IN FRENCH SPOKEN WORD RECOGNITION

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In three long-term repetition priming experiments, we investigated how stress information is processed and represented in the French listeners' mind. Repeated prime and target words either matched (/bǎ'do/ - / bǎ'do / 'head-band') or mismatched in their stress pattern (/bãdo/ - /bǎ'do/). Experiment 1 showed that match and mismatch primes were equally effective in facilitating the processing of the target words. In Experiment 2, the target words were presented in the left ear only, and attenuation in the repetition priming effect was observed when the primes and the targets mismatched in their stress pattern. The differential priming effect between match and mismatch primes was no longer observed in Experiment 3 when the targets were presented in the right ear only. Together, these results showed that stress in French is treated as surface variation, and influences word recognition provided that we constrain processing in the right hemisphere.

PS2.25. THOUGHT SUBSTITUTION MODERATES NEGATIVE VALENCE OF AVERSIVE MEMORIES

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Retrieval stopping can cause forgetting. Recent studies suggest that retrieval stopping can also reduce distress of aversive memories. Nishiyama et al. (2019) showed that direct suppression, one of retrieval stopping strategies, decreased negative valence and arousal for mentally healthy individuals, but increased those for less healthy individuals. The present study employed another retrieval stopping strategy, thought substitution, to see whether it can also reduce emotional distress and the effect is modulated by mental health. In the experiment, participants associated neutral objects with aversive scenes. Then they repeatedly stopped retrieving aversive scenes from the corresponding objects by engaging positive thoughts. Before and after this stopping phase, the participants retrieved the aversive scenes and rated the valence and arousal. Results showed that thought substitution decreased negative valence regardless of mental health, but it did not change arousal levels of the aversive memories.

PS2.26. ELECTRODERMAL ORIENTING RESPONSE - TOP DOWN OR BOTTOM UP PROCESS? I AM RUBBER YOU ARE GLUE: DO VERBAL SUGGESTIONS INFLUENCE US DIFFERENTLY?

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Research shows that automatic processes may be modulated by suggestions, challenging the idea of top down control. The orienting response of the sympathetic nervous system is thought to be automatic. The purpose of this study was to investigate whether simple everyday suggestions have an effect on the orienting response. Participants were exposed to two type of suggestions in an auditory oddball paradigm in two conditions. We hypothesized that suggestibility, condition and suggestion will interact to moderate responses. Our results show, that suggestions effect the orienting response and the effect of the suggestion interacted with suggestibility and condition. Thus the effect of the suggestion depends on the situation and the suggestibility of the person on the receiving end. In conclusion both bottom up and top down activation seem to be involved in the orienting response. Our results reaffirm the clinical usefulness of suggestive communication.

PS2.27. NAMING PICTURES SLOWLY FACILITATES MEMORY FOR THEIR NAMES

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Studies on the generation effect have found that coming up with words, compared to reading them, improves memory. However, because these studies used words at both study and test, it is unclear whether generation affects visual or conceptual/lexical representations. Here, participants named pictures after hearing the picture name (no-generation condition), backward speech, or an unrelated word (easy and harder generation conditions). We ruled out effects at the visual level by testing participants' recognition memory on the written names of the pictures that were named earlier. We also assessed the effect of processing time during generation on memory. In the recognition memory test, participants were more accurate in the generation conditions than in the no-generation condition. They were also more accurate for words that took longer to be retrieved, but only when generation was required. This work shows that generation affects conceptual/lexical representations and informs the relationship between language and memory.

PS2.28. MULTISENSORY INTEGRATION AND MOTOR RESONANCE IN SPEECH PERCEPTION: A NEUROPHYSIOLOGICAL APPROACH

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Humans are endowed with a motor system that resonates selectively to speech sounds ('echo mirror neuron system'). To test motor resonance to audio-visual integration in speech perception, we carried out a single-pulse transcranial magnetic stimulation (TMS) experiment. Motor-evoked potentials (MEPs) obtained with focal TMS applied over the left orbicularis oris (OO) muscle representation in the primary motor cortex (M1) were recorded in 20 healthy participants. Participants were asked to report the perceived syllable among four possible (/BA/, /PA/, /FA/, /VA/) presented either in a unimodal condition (e.g. visual or auditory) or in a multimodal audio-visual condition. Subjects showed better syllable discrimination in the AV condition as compared to the unimodal (A/V) conditions. Moreover, we observed increased MEPs amplitudes in the Congruent AV trials as compared to the unimodal one. Our findings demonstrate that enhanced multisensory resonance may facilitate speech processing.

PS2.29. AGE-RELATED DIFFERENCES IN THE UPDATING PROCESS FOR SOCIALLY MEANINGFUL MATERIAL: THE CASE OF HUMAN FACES

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Updating information is a crucial mechanism through which working memory operates. It consists of selecting and maintaining available relevant information, removing no-longer relevant. Our aim was to test possible age-related differences in a memory updating task with socially relevant material (i.e., human faces, Artuso, et al., 2012; 2015) and an updating task with non socially relevant material (i.e., letters, Artuso, et al., 2018). Interestingly, in the face updating task we manipulated the associations between gaze direction and emotion: strong observer self-meaningful associations (e.g., joy-direct gaze) were compared to weak ones (e.g., joy-averted gaze). In both tasks we considered updating efficiency as well as updating

speed. Overall, we found longer RTs and lower accuracy for the two older groups in both tasks. However, when considering the effect size of updating speed the updating of specific face features seems to be more preserved through aging, compared to other stimuli.

PS2.30. PROCESSING REFERENCES IN CONTEXT: WHEN THE POLAR BEAR DOES NOT MEET A POLAR BEAR

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Discourse understanding is hampered when presuppositions, i.e., essential context information, are not given. In three experiments, we investigated what happens (a) when the definite determiner "the", which presupposes uniqueness, does not find a unique referent in the context or (b) when the appropriate use of the indefinite determiner "a" is violated by the presence of a unique referent. Reading time served as an index of processing difficulty in a word-by-word self-paced reading task. Our results showed that missing context information lowered acceptability ratings and was associated with prolonged reading times. The extent of processing difficulty was related to the nature of the presupposition (Experiments 1 and 2) and the possibility for supplementing missing context information (Experiment 3). To account for our findings, we propose a model of presupposition processing which disentangles different cognitive processes that contribute to discourse understanding.

PS2.31. SHARED NEURAL REPRESENTATIONS OF CONFLICT AND AFFECT

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Over the last decade, an increasing number of studies have shown that cognitive conflict is automatically evaluated as negative, suggesting that the brain might process conflict and negative affect similarly. Here, we used MVPA on fMRI data to identify brain regions that show a similar voxel pattern response to conflict and affect. Twenty-nine participants performed a standard Stroop and color Flanker task, and two closely matched tasks using affective words or pictures, respectively. Preliminary results indicate that the voxel pattern in the SMA and vmPFC contained information about conflict, while affect was registered in the Amygdala. Importantly, cross-classification analyses where the pattern classifier was trained on positive versus

negative trials, and tested on congruent versus incongruent trials, indicated that the SMA/dACC responds similarly to negative affect and conflict. These findings are consistent with current theories suggesting that the dorsal anterior cingulate cortex (dACC) evaluates cognitive conflict as an aversive signal.

PS2.32. DISSOCIATION WITHIN PROCEDURAL LEARNING UNDER STRESS: BOOSTED STATISTICAL LEARNING BUT UNAFFECTED SEQUENCE LEARNING

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Stress promotes a shift from 'goal-directed' to 'habit' memory system, although the underlying processes remain elusive. Procedural 'habit' memory system includes several subprocesses. Here we aimed to disentangle these subprocesses – frequency-based statistical and order-based sequence learning – and to investigate how stress influences them. To induce stress, we used the Socially Evaluated Cold Pressor Test and the warm water test in the stress and control groups, respectively. To assess stress levels, we measured salivary cortisol levels. We used a probabilistic learning task (cued Alternating Serial Reaction Time task) to measure both subprocesses of procedural learning. Statistical learning was better in the stress group, particularly in the early phase of the task. However, stress did not affect sequence learning. These results are in line with previous research and go beyond by investigating subprocesses of procedural memory. Our results give a better understanding of how stress alters multiple memory systems and their interactions.

PS2.33. PARAFOVEAL PERCEPTION DURING READING INCONSISTENCIES IN ANIMATE AND INANIMATE DIRECT OBJECTS IN SPANISH

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In an eyetracking experiment using boundary technique we manipulated the presence of the Spanish mark *a* for animated direct objects (DO) with animate and inanimate complements. So, we manipulated two variables: animacy of the DO —animate vs inanimate— and the consistency of the VP (V + *al/ol/el* + DO) —consistent (V + *al* + animate DO and V + *el* + inanimate DO), control (V + meaningless *ol* particle + animate or inanimate DO), inconsistent (V + *el* +

animate DO or V + *al* + inanimate DO)—. Due to the boundary technique, participants only read consciously the consistent version of the sentences. Results showed that particle *al, ol, el* was skipped most of the times; among them, control particle *ol* was the less skipped (n+1 word effect) but only in the inanimate condition (n+2 word effect). Apart from the skipping effect we found longer gaze durations in inconsistent DOs. These results show that some information related to the agreement relationships was processed parafoveally.

PS2.34. ESTIMATION OF SPATIOTEMPORAL STATISTICS IN VISUAL STIMULI

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Humans can rapidly estimate the spatial statistics from stochastic visual inputs. In this study, we investigated the mechanisms involved in human discrimination of average orientation over space and time, by asking observers the orientation of the spatiotemporal average of dynamic texture, in which 4 or 32 frames of texture patterns with Gabor elements were serially presented. We found that the discrimination threshold was increased as a function of spatial SD when temporal SD was small, but remained nearly constant when temporal SD was large. Reverse correlation analysis revealed that observers emphasized the last few frames to judge the spatiotemporal average. The results are inconsistent with visual mechanisms that integrate local information equally across space and time, but support different mechanisms for spatial and temporal averaging: the one which rapidly computes the spatial average with sensory mechanisms, and the other which accumulates those average signals over time with decision mechanisms.

PS2.35. PROFICIENCY MODULATES BETWEEN- BUT NOT WITHIN-LANGUAGE STRUCTURAL PRIMING

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The oldest of the Celtic language family, Irish differs considerably from English with respect to typology. Less restricted accounts of bilingual shared syntax predict that processing datives and passives in Irish should prime the production of their English equivalents, regardless of differences in surface constituent structure. Furthermore, cross-linguistic influences should be sensitive to L2 proficiency, if shared structural representations are assumed to develop over time. In Experiment 1, we investigated

structural priming from Irish to English in 47 bilingual adolescents, educated through Irish. We found that priming for prepositional-object (PO) datives was predicted by self-rated Irish (L2) proficiency, in-keeping with previous studies. In Experiment 2, we presented translations of the materials to an English-educated control group (n=54). We found a comparable within-language priming effect for PO datives, which was not modulated by English (L1) proficiency. Our findings are compatible with current theories of bilingual language processing and L2 syntactic acquisition.

PS2.36. PERFORMANCE FEEDBACK ENHANCES TEST POTENTIATED ENCODING: AN EVENT-RELATED POTENTIAL STUDY ON THE TESTING EFFECT

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Previous research revealed that providing the full material after a retrieval attempt (test-potentiated encoding, TPE) enhances later memory performance. The goal of this study was to separate the effect of TPE and performance feedback (positive or negative). After a first exposure to all 180 weakly associated cue-target word pairs, 25 native speakers performed 2 repetition cycles either¹ restudying or² being tested or³ being tested with subsequent performance feedback. All trials were followed by another presentation of the full word pair (TPE). Results of the cued recall test (1 day later) indicate higher performance for tested compared to restudied items; feedback further boosted memory performance. ERP results revealed an increased TPE-locked "FRN" only when participants received feedback, particularly for negative feedback. Additional performance feedback seems to improve error monitoring and might promote learning by re-focusing attention to relevant (i.e. not previously learned) items.

PS2.37. STIMULUS AND RESPONSE CONFLICT FROM A SECOND LANGUAGE: STROOP INTERFERENCE IN WEAKLY-BILINGUAL AND RECENTLY-TRAINED LANGUAGES

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The Stroop effect is the observation of impaired responding when the word and colour are incongruent relative to congruent. This interference is due to conflict in meaning between the word and colour (i.e., stimulus conflict) and due to conflict between the responses suggested by the word and colour (i.e., response conflict). The present

studies investigated the source of the conflict in bilinguals. Participants performed a Stroop task, with distracting French (first language) and English (second language) colour words presented in colours. Despite poor English fluency, both stimulus conflict and response conflicts were observed with English (and French) colour words. In a second study, native French speakers learned a set of Croatian-French colour word translations before performing the same type of Stroop task. This study investigated whether newly acquired words from an unfamiliar language engender stimulus conflict, response conflict, or both.

PS2.38. IMPROVEMENT IN WORKING MEMORY UPDATING LEADS TO REDUCED DELAY DISCOUNTING RATE IN HEALTHY YOUNG ADULTS

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Whereas some authors claim that there is no reliable evidence of the working memory training (WMT) effectiveness, others suggest that they may have a far transfer on other non-trained processes, from basic perceptual to higher level cognitive functions. Our study tested whether an intensive WMT reduces delay discounting rate. The experimental group (N=26) completed on average 19 training sessions (30 min/day), consisting of three games similar to n-back, symmetry-span and operation-span tasks. The active control group (N=25) completed non-adaptive placebo training. The far transfer was measured with the Delay Discounting Task - a standard measure of the (in)ability to delay gratification. The two groups had an equal level of IQ and self-control. Working memory updating function (measured with the n-back task) increased only in the experimental group. As a result, there was a significant improvement of the delay discounting task performance (k-value reduction), providing evidence for the WMT effectiveness.

PS2.39. DELAYED PROCESSING OF FAST AUDITORY CHANGES IN OLDER ADULTS SUGGESTS DETERIORATED TEMPORAL RESOLUTION OF AUDITORY SYSTEM WITH AGING

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A recent study (Volosin et al, 2017) found that short gaps embedded into continuous tones elicited enhanced N1 amplitudes when rare glissandos (glides) preceded them

by 150 ms (in comparison to gaps without any preceding glides). Exploratory analyses comparing data from younger and older adults suggested that the enhancement was due to an overlapping mismatch negativity (MMN), which was delayed in older adults, and was interpreted as reflection of age-related deterioration of auditory temporal resolution. In the present study the roles of the glides and gaps were reversed: gaps were presented rarely, while glides were presented frequently. MMN elicitation and age-related delay was replicated, and contrary to previous results, glides separated from rare gaps in 150 ms led to decreased N1 amplitudes, irrespectively of age. Our results contribute not only to better understanding of declined auditory temporal resolution in older age but also to the knowledge on MMN elicitation mechanisms.

PS2.40. CONFORMITY AND COLLECTIVISM: A CROSS-CULTURAL COMPARISON

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Increasing evidence suggests that social conformity declines in modern Western societies. In the present study, we compared conformity behavior in Western European and Chinese students. Both groups of participants were presented with 110 pairs of pictures and had to choose the one they preferred, before they were confronted with the same or an opposite choice that they were told to represent either their peers' opinion or a random choice. Then they judged the pictures again. If the intervening events were believed to represent the opinion of their peers, Chinese participants demonstrated a higher degree of conformity than European participants. In a follow-up experiment the similarity between the participants' judgment and the intervening event was increased by presenting a short movie showing a human hand pressing a choice key. This increased conformity in the European group, suggesting that the hand movie made the social nature of the intervening event more salient.

PS2.41. SUBLEXICAL COMBINATIONS OF STROKE PATTERNS AND THEIR ROLE IN CHINESE CHARACTER RECOGNITION

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The recognition of Chinese characters by experienced readers is based upon a limited set of orthographic constituents (Chen, Allport, & Marshall, 1996). The majority of Chinese characters are composed of two or more of these

components. Current models of word recognition in Chinese acknowledge the special role of components in character recognition, but often do not specify a representational level for sublexical combinations of them (e.g. Taft & Zhu, 1997). However, in characters with more than two components, such sublexical combinations or compounds are often present. In a probe detection task, we examined whether compounds act as a perceptual unit of representation during character reading. Targets were four-component characters containing a two-part compound that either existed as a character on its own or not. Probes were single components or compounds. Apart from Chinese readers, participants without prior knowledge of Chinese were included to ensure no visual bias was present.

PS2.42. DO ALCOHOL CUES MODULATE PERFORMANCE OF COGNITIVE CONTROL TASK IN ALCOHOL ADDICTS?

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Study aimed on revealing influence of alcohol cues reactivity on performance of cognitive control task in alcohol addicts. Cognitive control tasks included Go/Nogo flanker task, 1-back task. Subjects performed tasks in three conditions: without reinforcement; reinforcement of correct answer by alcohol-related picture exposure and reinforcement of mistakes by pictures with non-alcohol drink; inverse to second one reinforcement. Pilot study included 4 alcohol addicts underwent treatment (males, age 43,3(6,4) (M(σ)), and enrolment is in progress. Linear mixed models were conducted to assess conditions, stimuli type effects. Effects of conditions were not significant. Response time to incongruent stimuli was higher in comparison with congruent stimuli in Go/Nogo flanker task ($p < 0,001$). In 1-back task response time to incongruent stimuli was larger in comparison with congruent stimuli ($p < 0,001$). Subjects enrolment will clarify results. The study was supported by RFBR grant (project №18-013-01237).

PS2.43. IMPACT OF LINGUISTIC IMMERSION PROGRAM TO L2 ON L3 WORD LEARNING: SPECIFIC OR GENERAL EFFECTS?

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Linguistic immersive programs (LIP) are characterized by an academic early exposure to L2. Word learning (WL) in a

third language (L3) is facilitated among early bilingual adults compared to monolingual peers (Kaushanska & Marian, 2009). This learning advantage might be linked to cognate facilitation effect (CFE), as retrieved in L2 WL studies (Comesaña, 2012). Immediate assessment of learning performances investigated whether L3 WL advantage might be retrieved when having learned L2 in a LIP context (N= 40 bilingual fifth graders vs N= 46 monolinguals peers) and explained by CFE. 44 English words, i.e. German-English cognate words (Helm-helmet) vs monolingual English words (Gabel-fork), were learned. A general WL facilitation was observed among children with linguistic immersion to German. However, CFE was retrieved for reaction times measures only, suggesting that bilingualism provides a general L3 learning advantage, reinforced by the cognate status of L3 words.

PS2.44. COORDINATING SPEECH IN CONVERSATION RELIES ON EXPECTATIONS OF TIMING AND CONTENT.

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Speakers are skilled at avoiding overlaps and gaps in conversation. This coordination might be achieved by predicting what an interlocutor will say or when their turn will end. We tested this in a paradigm where participants saw two pictures, heard the pre-recorded name of the first 'prompt' picture, and tried to produce the second picture's name immediately following the recording offset. We varied prompt length (monosyllabic/disyllabic) and whether prompt length was predictable (mixed/blocked presentation), and on some trials, the prompt picture was occluded from the participant (replaced with #). In Experiment 1; items were numerals, in Experiment 2 they were object names. In both experiments, disyllabic prompts in blocked presentations improved coordination, while occlusion only slightly hindered coordination. This shows individuals use predictions of timing (blocking) and content (length, occlusion) to coordinate their speech: we separately track when we expect interlocutors to be done speaking and what they might say.

PS2.45. CHANGE BLINDNESS TOWARD FOOD STIMULI IN NORMAL-WEIGHT AND OVERWEIGHT PEOPLE

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Many studies reported an attentional bias (AB; i.e., an automatic response) toward food-stimuli (FS) in overweight-

individuals. However, the paradigms used to evaluate it usually require rapid responses that do not allow assessing the behaviour in ecological conditions when FS persist for a long time. This possibility is given by the flicker task (FT) in which two pictures, identical except in one detail, are alternatively presented. The changes are of central interest (rapid detection) or marginal interest (longer detection). FT allows evaluating change blindness (CB), i.e., the inability to detect changes occurring between two consecutive views of a scene. This study aims to evaluate CB toward FS in normal-weight and overweight people. Eighty-eight students (44 overweight / 44 normal-weight) complete a Food-FT. Results showed an AB toward hypercaloric FT when changes were of marginal interest and no between-group differences. These findings suggest an AB toward FS in all the individuals, independently from their BMI.

PS2.46. CONSISTENCY BETWEEN AFFECTIVE CONTENT AND SUBLEXICAL PHONOLOGY DRIVES N400 EFFECTS IN VISUAL WORD RECOGNITION

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We presented participants in a standard visual lexical decision task with German words of either negative-high arousal or neutral affective content. At the sublexical level, words were composed either of phonemes that typically occur in many other words of negative-high arousal lexical affective meaning or not. When lexical affective content and sublexical phonological organization were inconsistent, N400 ERP amplitudes were larger than in cases of affective consistency. These data indicate that sound to meaning correspondences with regard to affective content influence already basic levels of language processing where lexical affective meaning and phonological sublexical content have to be integrated during the process of lexical access.

PS2.47. WHAT IS THE BRAIN MADE OF? EXAMINING CHILDREN'S DEVELOPING REPRESENTATIONS THROUGH THEIR DRAWINGS

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Recent studies in neuroeducation underlie the benefits of teaching children about how the brain works. However, little is known about children's naïve representations of the brain. The current study examined these representations,

by asking 5- to 11-year-old children (N = 257) to draw a brain (and a stomach – as a control drawing). The drawings were scored using a content analysis and a list of graphic indicators was derived. First, all the graphic indicators used in the brain drawings were different from those used in the stomach drawings, suggesting that children are able to distinguish these two parts of the body. Second, 5- and 6-year-olds tended to draw the brain as an empty shape, whereas from the age of 7, children used an increasing number of graphic indicators such as hemispheres, furrows, lobes, and brainstem. These results are discussed in relation to children's metacognitive knowledge and to their implications for neuroeducation.

PS2.48. EFFECT OF INSTRUCTED REVERSALS ON CARDIAC AND NEURAL RESPONSES DURING AVERSIVE LEARNING

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During aversive learning, heart rate changes in response to conditioned stimuli and in preparation of upcoming aversive events. Previous studies have linked the magnitude of these responses to quantities derived from models of learning, such as associative value or prediction error. But knowledge of relations can come from other sources, such as instructions. Recent studies have dissociated two neural systems of aversive learning, one that is modulated by verbal instructions (striatum and orbitofrontal cortex) and another (amygdala) that updates with reinforcement. Here, we investigated cardiac responses in humans during an aversive learning task with reversals, to test whether instructed knowledge modulated phasic cardiac responses. One group was informed about contingencies and reversals, and another group learned from reinforcement only. Cardiac responses updated immediately after instruction. We further analyze trial-by-trial changes comparing instructed vs. reinforcement contributions to learning, and link them to neural responses measured in electroencephalography.

PS2.49. UNDERSTANDING EFFECTS OF WORKING-MEMORY TRAINING: A COGNITIVE MEASUREMENT MODEL FOR CHANGES IN MEMORY CAPACITIES AND STRATEGIC ADJUSTMENTS

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What changes when younger and older adults complete extensive working-memory training? Differences in behavior can result from changes in memory capacities or strategic adjustments to the task environment. We examined data from a large-scale age-comparative study in which 101 younger and 103 older adults practiced a spatial 3-back task for approx. 100 daily sessions. Although older adults performed worse - especially for intrusion probes (i.e., probes matching recent non-target stimuli), both age groups improved with practice. To investigate the sources of these improvements, we developed and refined a cognitive model in a Bayesian-hierarchical framework. This model incorporates parameters for memory capacities (i.e., familiarity from recent presentation and recollection due to binding memories to the current context) and strategic adjustments (i.e., bias toward and thresholds for giving responses). This allowed us to disentangle practice-induced changes in memory capacities and strategies of both age groups.

PS2.50. EFFECTS OF BINAURAL BEATS AND ISOCHRONIC TONES ON EXECUTIVE FUNCTIONS AND AUTONOMIC CARDIAC FUNCTION

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Binaural beats are an auditory brainwave entrainment technique shown to enhance various cognitive functions and to produce changes in autonomic arousal. Isochronic tones, a less well-known form of auditory stimulation, are suggested as having similar benefits. Empirical studies have yet to report on whether both techniques induce changes in superior cognitive functions (executive functions) and/or changes in autonomic arousal. The aim of this study was to compare their effects on performances in three executive function tasks and on cardiac dynamics of heart rate variability. The results showed that the Isochronic tones group made more errors than controls on two executive function tasks. We also observed that a particular profile surfaced through the different groups' performances on tasks, concurrent with their physiological profile. We suggest that isochronic tones may induce potentially detrimental effects on executive functions and also that autonomic cardiac function could be linked to certain behavioral responses.

PS2.51. COGNITIVE CONTROL IN NUMBER PROCESSING: FIRST EVIDENCE FROM TASK SWITCHING

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Recently, it was observed that even basic number cognition such as the processing of number magnitude is under cognitive control. However, evidence so far primarily came from adaptation effects to stimulus characteristics (e.g., relative frequency of specific item categories). Expanding this approach, we evaluated influences of active exertion of cognitive control in terms of task switching on basic number processing. Participants had to perform a magnitude comparison task while we manipulated the order of compatible and incompatible input-output modalities (i.e., auditory/visual input – verbal/manual output vs. auditory/visual input – manual/verbal output, respectively) on the trial level differentiating repeat vs. switch trials. Results indicated that the numerical distance effect but not the problem size effect was elevated after a switch in input-output modality compatibility. In sum, this finding provides first evidence that basic number processing is influenced by the active exertion of cognitive control as necessary in task switching.

PS2.52. VAGAL SIGNALING AND THE SOMATIC MARKER HYPOTHESIS: TRANSCUTANEOUS VAGAL NERVE STIMULATION ENHANCES THE EFFECT OF LOW POSITIVE MOOD STATE ON DELAY DISCOUNTING RATE

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Controlling impulsivity and delaying gratifications are key features of effective regulatory behavior. Delay Discounting (DD) indexes reward delaying and it is influenced by affective states. The Somatic Marker Hypothesis highlights that the afferent vagus mediates mood effect in decision making, while efferent vagal tone (indexed by heart rate variability; HRV) has been related to enhanced regulatory control, according to the neurovisceral integration model. We employed transcutaneous vagus nerve stimulation (tvNS), a novel non-invasive brain stimulation of the afferent vagus, to assess its effects on decision impulsivity, while taking into account resting-state HRV and individuals' mood. Active tvNS, compared to sham, increased discounting only for participants reporting lower positive mood. We suggest that tvNS modulates the relationship between affective mood state and decision making and propose that the influence of positive mood state, possibly

a marker of task-relevant arousal, on reward discounting might depend on afferent vagal signals.

PS2.53. INFANT DIRECTED SPEECH TO INFANTS AT FAMILY RISK FOR DYSLEXIA

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Infants born to a dyslexic parent are at-risk (AR) for developing dyslexia, and they already exhibit auditory processing deficits in their first months of life. Additionally, AR infants are exposed to infant-directed speech (IDS) that differs in acoustic quality from IDS to not at-risk (NAR) infants. IDS is typically characterized by vowel hyperarticulation, the expansion of the acoustic space between vowel categories, but this component is absent in IDS to 9-11-month-old AR infants. This study assessed vowel hyperarticulation and the linguistic complexity (Mean Length of Utterance, MLU) in IDS to 19-month-old AR (N=22) and NAR (N=19) infants. NAR mothers produced IDS with a higher degree of vowel hyperarticulation, $t(39)=2.321$, $p=.026$, and reduced linguistic complexity (lower MLU), $t(39)=2.496$, $p=.017$, than AR mothers. Throughout their first years of life, AR infants' linguistic input is acoustically and linguistically distinct from their NAR peers, which can yield long-lasting effects on their later linguistic development.

PS2.54. LEARNING TO LEARN: TRANSFER OF STRATEGIC TASK COMPONENTS BETWEEN UNIQUE TASKS WITH A COMMON STRUCTURE

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Research investigating transfer of strategies between unique tasks with a similar structure has tended to focus on the entire strategy rather than strategic task components. We investigated how different kinds of training affected performance at test where participants classified dot patterns according to their similarity to category templates by entering response 'codes'. Five training conditions were contrasted in which participants: (a) practiced several unique dot-pattern classification tasks similar to the test task; (b) practiced entering response codes similar to those used at test; (c) gained some experience with the kinds of stimuli used in the test task; (d) practiced different kinds of classification tasks; and (e) could not learn anything useful about the test task (the control). Transfer was

better in all training groups relative to the control group, indicating that prior experience can be applied to unique tasks that share some strategic components with the training tasks.

PS2.55. THE WORKING MEMORY TRAINING REDUCES SUSCEPTIBILITY TO PONZO ILLUSIONS IN A GROUP OF FIELD-DEPENDENT SUBJECTS

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The effectiveness of computerised cognitive trainings have recently become a topic of interest and controversy. The purpose of the study was to reduce the size of geometric illusions (orientic and metric) using three types of trainings, dedicated to improve specific cognitive functions (perception, attention and WM). Moreover, we examined whether cognitive trainings would be more beneficial for field dependent or field independent individuals. 256 subjects aged 19-32 ($M = 24.60$, $SD = 3.22$) participated in the pre- and post-test to diagnose field dependence-independence and to measure resistance to geometrical illusions. The Embedded Figures Test (EFT) and Visual Illusion Simulation (VIS) were applied. Three experimental groups (WM, attention and perception) completed 18 training sessions. A non-active group completed a non-adaptive placebo training. The results revealed that a multi-domain WM training reduced susceptibility to the Ponzo illusion in a group of field-dependent subject.

PS2.56. CONTINUOUS DIMENSIONS AFFECT NUMBER COMPARISON TASKS, BUT NUMBER AFFECTS CONTINUOUS COMPARISON TASKS

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Humans possess a numerical intuition that allows them to manipulate non-symbolic quantities. This intuition has been broadly assessed with the help of number comparison tasks involving dot arrays displayed simultaneously. Yet proper comparison could actually be achieved through many non-numerical cues inherently confounded with number within dot arrays. We here investigate how number interacts with these visual dimensions: young adults took part in one number comparison task, and one each for four distinct non-numerical dimensions (the total area, the dot size, the size of the convex hull, and the mean

occupancy). We replicated the observation that visual continuous dimensions substantially affected number comparisons, but we observed that the number of dots conversely affected some of the visual comparison tasks, although number was here irrelevant to the tasks. We discuss these findings from the perspective of intentional and automatic number extraction.

PS2.57. LEXICAL COMPETITION IN NAMING: EFFECTS OF ORTHOGRAPHIC NEIGHBOURHOOD FREQUENCY AND INDIVIDUAL DIFFERENCES IN LEXICAL SKILLS

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This study investigated lexical competition in the naming task according to individual differences in lexical skills in adult French readers. We examined the orthographic neighbourhood frequency effect by comparing words with one higher-frequency neighbour by letter deletion (e.g., *pliage-plage*) to words with no such neighbour (Experiment 1), and by comparing words with one higher-frequency neighbour by letter substitution (e.g., *flocon-flacon*) to words with no such neighbour (Experiment 2). In each experiment, two groups of 45 adults with high- versus low-lexical skills were constituted. The data showed an inhibitory orthographic neighbourhood frequency effect on response times (Experiments 1-2). Neighbourhood frequency by letter deletion interacted with lexical skills (Experiment 1) while letter-substitution neighbourhood did not (Experiment 2). However, visual confusability degree of the substituted letter interacted with lexical skills in Experiment 2. The results are interpreted in an interactive activation and competition model of visual word recognition with spatial coding.

PS2.58. CAN LANGUAGE CUE THE VISUAL DETECTION OF BIOLOGICAL MOTION?

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In this study, we employ signal detection theory to investigate the interaction between language and perception within the domain of (biological) motion. In two experiments with a priming paradigm ($N = 40$ each), we examine the extent to which language can cue the detection of biological motion in a multistable, dynamic environment – a point-light figure hidden within a random-dot motion aperture. Linguistic cues varied in terms of specificity

regarding features of (biological) motion: (in)congruent biological motion (rower, dancer); biological form (brother, father); general motion (snow, smoke). Results show that only linguistic cues fully congruent with the visual biological motion enhanced its detection (Exp. 1 (yes-no task): accuracy, RT, Criterion; Exp. 2 (discrimination task): RT). Findings suggest that motion language can trigger our highly specialised biological motion detection mechanism, but only when the language overlaps in degree of specificity on core biological motion features: kinematics and (human) form.

PS2.59. THE LOCUS OF PHRASE FREQUENCY EFFECT IN ADJECTIVE-NOUN PHRASE PRODUCTION

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Recent behavioral studies reported that high frequency phrases are produced with shorter speech onset latencies than low frequency phrases. The locus of this effect, and therefore its implications for models of language production, are unclear. In this study 40 German native speakers named pictures using an adjective-noun phrase. Half the phrases had a high frequency (e.g., weißes Hemd, 'white-shirt'), the other half had a low frequency (kleines Hemd, 'small-shirt'). We first examine whether the phrase frequency effect can be replicated when different combinations of the same word sets are used to build the high and low frequency phrases. We then investigate the time course of this effect by comparing the Event-Related Potentials of these phrases. Finally, we examine the consequences of phrase frequency on speech fluency by comparing the acoustic properties of high and low frequency phrases. The implications of these data for our understanding of multi-word production are discussed.

PS2.60. AGEING AND ATTENTIONAL NETWORKS: ORIENTING, ALERTING AND EXECUTIVE CONTROL IN ELDERLY PEOPLE.

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Ageing is associated with attentional performance decrease. However, it is not clear if there is a global attentional deficit or specific attentional networks impairment. This study aims to explore age effects on the three attentional networks (Alerting, Orienting and Executive Control). Thirty students (age: 23.6±0.85), thirty middle-age adults (age: 58.3±0.85) and twenty-seven older adults (age: 71.4±0.89) participated in the study and completed

the Attentional Network Task Interaction-Fruit. Results show that Reaction Time was reduced during the process of healthy ageing, alerting and orienting effect became more pronounced, while the executive effect remained unchanged. Moreover, old adults show increased attentional costs. It is interesting to note how the difference in orienting, unlike other networks, is independent by general slowing. Given the importance of attentional orienting for everyday functions, it is relevant to understand the nature of this deficit to schedule interventions aimed at counteracting it.

PS2.61. REDUCED CAUSAL ILLUSIONS IN A PASSIVE CAUSAL LEARNING TASK AFTER A SHORT DEBIASING INTERVENTION

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This study builds on our previous research focused on designing and testing educational debiasing interventions which make people more resistant to causal illusions. Our preceding work suggested that the enhanced resistance to causal illusions was mediated by a change in the information search strategies adopted by the participants when facing an active causal learning task. The present work demonstrates that the effect extends to situations in which causal inferences are required in the context of a passive causal learning task. These results suggest that the positive influence of the intervention is not limited to the participants' information search strategy, but also to the way they interpret the information that is available to them.

PS2.62. IS INTEROCEPTIVE ACCURACY RELATED TO COGNITIVE REAPPRAISAL ABILITY?

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It has been reported that higher interoceptive accuracy (IAC), which is defined as the ability to accurately detect the physiological sensations inside the body, is related to cognitive reappraisal ability. However, the heartbeat counting task used in the previous studies to measure IAC is known to be influenced by confounding factors (e.g., response biases). The present study was conducted to re-examine the relationship between IAC and cognitive reappraisal ability by using the heartbeat discrimination task because it is not influenced by the confounding factors. Nineteen participants performed the heartbeat discrimination and reappraisal tasks. We found no significant correlation between the IAC and cognitive reappraisal ability ($r = .126$, $p = .606$).

This result implies that it not the IAc itself but the confounding factors that affect the heartbeat counting task that might relate to cognitive reappraisal ability.

PS2.63. BOUNDARY EXTENSION IN RECOLLECTION AND FAMILIARITY BASED MEMORY RESPONSES

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Boundary extension is the intriguing phenomenon that when we remember previously perceived scenes we reconstruct these scenes with extended boundaries. It seems we make a prediction of the natural continuation of a scene within a spatial framework. A number of bottom up and top down influences affect the degree of boundary extension. In a first study we investigated how boundary extension is linked to mental imagery, visuospatial construction, mental rotation and object location memory. A pattern of moderate correlations was found. In a second study we examined in how far subjective quality of memory is accompanied by increased boundary extension. We observed that recollection responses ('remembering') and familiarity responses ('knowing') yielded equal degrees of boundary extension. Together these results shed further light on the cognitive architecture of boundary extension and suggest that it is not a prerequisite for recollection but rather a generic memory attribute.

PS2.64. SURVIVAL PROCESSING: THE EFFECT OF RETENTION INTERVAL

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Previous studies have found that survival processing produced higher memory than other types of processing. We report two experiments exploring the role of retention interval on the survival-processing effect. Participants rated 64 words according to their relevance for a moving or survival scenario. Afterwards, they performed a surprise recognition test with 10-minutes (Experiment 1) or 1-hour delay (Experiment 2). Results showed that survival processing led to higher recognition and lower false alarms than moving processing. That is, survival processing boosted memory accuracy, both identifying words that were rated and rejecting words that had not been rated. Even more interestingly, we found that the difference in recognition between survival and moving processing was higher with 1-hour than 10-minutes delay (12.72 vs. 6.25, respectively). This last result is due to the fact that

increasing the retention interval from 10-minutes to 1-hour reduced recognition in moving processing but did not in survival processing.

PS2.65. EVIDENCE FOR FOVEAL HAPTIC REPRESENTATION OF OBJECTS IN THE ABSENCE OF VISION

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FMRI evidence shows that cortical activity in primary visual cortex (V1) is informative of object shapes when that information has not been acquired visually. A theory of V1 as all-purpose spatial blackboard has been proposed. Here we explore some implications of this hypothesis. It is known that visual information in V1 is re-mapped according to eye-position to be used by the rest of the brain. Is this true also for the putative haptic representation? We tested whether different gaze positions could induce errors in haptically-guided behavior. Participants haptically explored one of different objects occluded from vision, and then reached it to grasp it while fixating towards the direction of the object or laterally to it. Grip aperture during reach was measured. We found that gaze direction influences hand's grip aperture, which increased when participants looked at lateral positions, indicating that haptic object information is reframed according to gaze-position.

PS2.66. SHOULD I STAY OR SHOULD I GO? THE EFFECT OF LOCAL-GLOBAL FOREPERIOD PROBABILITY ON IMPLICIT MOTOR PREPARATION: A NEUROPHYSIOLOGICAL INVESTIGATION.

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We investigated the interaction between local and global predictive rules in generating implicit action preparation toward imperative stimuli. Both behavioural and electrophysiological responses of thirty-six participants were collected during a warned reaction time paradigm defined as Dynamic Temporal Prediction task. The foreperiod interval was manipulated within-trial (short, medium or long) to generate a local predictive rule. The probabilistic distribution of each foreperiod was also manipulated between-block to obtain three global distributions (short-biased, uniform or long-biased). We found that participants were fastest when the imperative stimulus was maximally expected as a function of local prediction (long foreperiod). Task performance was also adjusted on the basis of the global prediction, being fastest in the fastest block (short-biased). This adaptation was mediated by the modulation of a frontoparietal network involving anterior cingulate,

left intra-parietal sulcus, occipital and premotor areas. These findings show that implicit motor preparation is a flexible rather than rigid mechanism.

PS2.67. DO SERIAL ORDER WORKING MEMORY ABILITIES DECLINE IN HEALTHY AGING?

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The preservation of the ability to maintain information over the short-term in healthy aging remains a controversial question. We assessed verbal working memory abilities in 30 young and 30 older adults by focusing directly on the maintenance of serial order information, an aspect rarely considered in previous studies. Participants heard and repeated in correct serial order word or nonword sequences of increasing list length. Bayesian statistics showed moderate evidence for an absence of group effect on item recall performance ($BF_{01} = 3,25$ for words, $BF_{01} = 1,26$ for non-words). When focusing directly on serial order recall performance, we observed anecdotal evidence in favor of a group effect ($BF_{10} = 2,9$ for words; $BF_{10} = 0,5$ for non-words). These results suggest that if there is any reduction of verbal WM abilities in healthy aging, it is very small and may be limited to the maintenance of serial order information.

PS2.68. HIGH MVPA DECODING ACCURACY FOR ABSTRACT TACTILE BRAILLE NUMBERS IN THE INTRAPARIETAL SULCUS (IPS) OF SIGHTED BRAILLE READERS

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The IPS plays a key role in processing numbers. According to the "triple-code theory" (Dehaene, 1992), it contains a modality-independent abstract magnitude code, co-existing with modality-specific symbolic codes (visual Arabic digits, number words...).

In an fMRI multi-voxel pattern analysis (MVPA) experiment, sighted Braille readers were presented with blocks of numerosities in tactile abstract (Braille), visual abstract and visual non-abstract formats. Previous studies (e.g. Bulthé et al., 2014) found that abstract visual numbers had low decoding accuracy, interpreted as symbolic numbers being mapped onto a subset of a broader population of IPS neurons tuned for corresponding non-symbolic

representations. Non-symbolic numbers were assumed to be easier to decode because of their wider representation. Here, we found that tactile numbers, despite being abstract, were robustly decodable in parietal regions. This suggests that low accuracy for visual abstract stimuli is due to their visual nature and/or overtraining, not to their abstract nature itself.

PS2.69. CROSS-MODAL PERCEPTION OF SINGING PERFORMANCE: THE ROLE OF FACIAL EXPRESSION AND MODALITY ON PERCEIVED EMOTIONAL EXPRESSIVITY

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We investigated in two studies (laymen, experts) cross-modal perception in an applied setting. Singing might be a special case, because sound-producing and ancillary orofacial actions are not independent and might interfere regarding emotion communication. We focused on two aspects (a) the specific effect of expressive versus suppressed facial movements, and (b) the general impact of the visual modality in bimodal perception. We recorded professional singers, performing with expressive or suppressed facial expressions. We selected 15 excerpts (length 9–23 s) and created 120 uni- and bimodal stimuli (audio, video, audiovisual). Perceived emotional expressions were rated using an 11-item questionnaire, based on the heuristic analyses of professional musicologists. We demonstrated an effect of expressivity, which interacted with modality, with no effect for auditory stimuli and a small for visual and audiovisual stimuli. In addition, we replicated the effect of visual dominance for bimodal stimuli, which has been demonstrated for instrumentalists before.

PS2.70. GENDER MATTERS: VOICE PROCESSING OF MALE AND FEMALE SPEECH IN THE DOG BRAIN

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It is well known that newborns prefer motherese over unfamiliar females' baby-talk and fatherese (DeCasper & Prescott, 1984). It has also been shown that motherese, fatherese and dog-directed speech (doggerel) share some acoustic features like high fundamental frequency and wide range (Gergely et al., 2017). In the present study we used non-invasive brain imaging (fMRI) to measure dogs' neural responses to dog-, infant- and adult-directed speech produced by female and male speakers. Left temporal areas of the dogs' brain responded stronger when hearing

doggerel compared to infant- and adult-directed speech of female speakers. Moreover, female doggerel elicited greater activation than male doggerel in similar brain regions that proved to be sensitive to mother's voice in babies (Dehaene-Lambertz et al., 2010). These results suggest similar voice processing of motherese and female dog-directed speech in two genetically distinct species and support the notion that female voices are more salient than male voices.

PS2.71. IS THE AMOUNT OF EXPOSURE A GOOD PREDICTOR OF LANGUAGE DEVELOPMENT? EVIDENCE FROM A BILINGUAL POPULATION.

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The relationship between amount of exposure (AoE) to a language and vocabulary knowledge is straightforward and has been addressed in depth. However, the link between AoE and the development of other fundamental domains, such as phonology and morphology, is not as clear. We will address this question by presenting the first stage of a longitudinal study in which we explore whether AoE can predict each of these domains. We selected 74 Spanish-Basque bilingual preschoolers (mean age = 3;11 yo) with a wide range of differences in their exposure to each language. We tested expressive and receptive vocabulary, phonological short-term memory and a naturalistic measure of mean length of utterance (as proxy measure of morphological development). Our results show the AoE as a relevant predictor of vocabulary and morphological development. However, phonological skills are not predicted by AoE and could be better explained as a mediating factor.

PS2.72. EFFECT OF PERCEIVED INTERPERSONAL CLOSENESS ON THE JOINT SIMON EFFECT IN ADOLESCENTS AND ADULTS

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We investigated the effect of interpersonal closeness on joint action using the joint Simon task in adolescents and adults. In a two-choice reaction time task, responses to non-spatial stimulus attributes are faster when stimulus and response locations are congruent than when they are incongruent. This effect, called Simon effect, is absent when a participant responds to only one of the stimuli.

However, a Joint Simon effect (JSE) reappears when two participants carry out the tasks together each responding to one of the stimuli. Here, we measured joint Simon effects in adolescents and adults, and investigated the effect of interpersonal closeness on its magnitude. We found a significant JSE and a positive correlation between its magnitude and the level of closeness, with no difference between the two age groups. Our findings suggest that the JSE is sensitive to the social factor of interpersonal closeness and its mechanisms are already mature by adolescence.

PS2.73. THE EFFECT OF PERFORMANCE BASED GAIN AND LOSS STIMULI ON ARITHMETIC PERFORMANCE

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Emotion can modulate various cognitive performances. Recently, Naaman and Goldfarb (2017), found that random gain stimuli facilitates arithmetic performance. The literature suggests that the contingency of stimuli administration -being perceived as performance based or random have different influence on cognitive performances. The current study aimed to examine the influence of perceived performance-based gain and loss stimuli on arithmetic performance. While the procedure and stimuli administration were the same in the performance based and random design, the results demonstrated a differential effect for the perceived contingency. That is, merely perceiving the stimuli as performance based eliminated the random gain stimuli facilitation effect. These findings are further discussed within the context of the relationship between gain and loss stimuli and arithmetic performance.

PS2.74. PRECISION OF ISOLATED FACIAL-EXPRESSION AND BODY-POSTURE REPRESENTATIONS DETERMINES INTEGRATED WHOLE-PERSON PERCEPTION OF EMOTION

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The perception of facial expressions can be modulated by affective body postures. For instance, humans are more likely to perceive disgusted facial expressions as 'angry' when paired with an angry body. Interestingly, the influence of body context is highly variable across individuals, offering an opportunity to study the mechanisms underlying integrated whole-person perception. Using

psychophysical tasks in combination with computational modelling, we indexed the precision of representations of isolated facial expression and body posture cues, as well as the influence of each cue on the integrated whole-person emotion percept. The results indicate that the perceptual integration leading to whole-person representation is determined by the precision of the individual cues. These results provide the basis for developing a mechanistic model of how facial expression and body posture cues are combined to create integrated whole-person percepts of emotion, and have important implications for our understanding of real-world individual differences in social perception.

PS2.75. VISUOSPATIAL ASYMMETRIES AND ORIENTING OF ATTENTION IN THE ELDERLY

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Deficit of attention in the elderly has been attributed to the physiological decline of the right hemisphere. Current evidence, however, is inconsistent about the impact of aging on visuospatial attention. In this study we compared younger (N=36, mean_age=20yrs) and elder adults (N=24, mean_age=70yrs) in visuospatial attention tasks: line bisection, measuring spatial bias (pseudoneglect), and Posner cueing paradigms, measuring exogenous and endogenous attentional orienting (validity effect and inhibition-of-return (IOR)). Pseudoneglect was observed in younger but not elder adults, although in the absence of a significant group difference. Validity and IOR were observed in the cueing tasks, and they did not interact with group. Different patterns in the two groups were observed when performing separate analyses. Principal components analysis suggests the existence of distinct mechanisms for endogenous and exogenous orienting, associated with spatial asymmetry and age, respectively. The results will be discussed in light of the existing literature on the elderly.

PS2.76. THE INFLUENCE OF SLEEP ON RELEARNING AND LONG-TERM RETENTION OF VERBAL ITEMS

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How sleep affects relearning and long-term retention is a critical question for studying the connection between sleep and learning. For instance, authors Mazza et al. (2016) have shown that Swahili-French word pairs were relearned faster after a 12-hour interval when nocturnal sleep was interspersed during this interval, and that word pairs were

also better recalled one week later. However, this previous study used an intensive relearning procedure with feedback until a criterion of all 16 items correct in a row, possibly leading to overlearning. We replicated this original study with a less stringent criterion for relearning, i.e., one correct answer per item. The data currently being collected will indicate whether the sleep effect on relearning and on long-term retention found in this previous study was due to the specific relearning methods inducing overlearning. Our preliminary results suggest no effect of sleep on relearning speed or on long-term retention.

PS2.77. THE QWERTY EFFECT: NEW INSIGHTS

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Jasmin and Casasanto (2012) showed that words spelled with more right-side letters on the keyboard were rated as more positive in valence than words spelled with more left-side letters (the so-called QWERTY effect). In five studies, our goal was to explore this effect to better understand it. A significant QWERTY effect was found in French with pseudo-words and emotionally neutral words, but not with emotional words, suggesting that the QWERTY effect can be found only when emotional valence is weak. An inverted QWERTY effect was found in Bengali language and could be explained by special keyboard features. Finally, a new effect was observed: pseudo-words with more closed-body letters (i.e. letters "c", "b" and "n" are closer to the body than letters "r", "t" and "y") were rated as more positive than pseudo-words with more distant-body letters. This last effect is discussed in the framework of embodiment theories.

PS2.78. DISENTANGLING STIMULUS AND RESPONSE COMPATIBILITY IN A DUAL-TASK FLANKER PARADIGM

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In two experiments (N=60 each), we investigated the locus of the flanker effect. Specifically, we embedded the typical flanker task within a dual-task paradigm by assigning stimulus-response (SR) mappings to the flankers. In Experiment 1, participants were instructed to first respond to the center letter and only respond to the flanker if the center is a no-go stimulus (i.e., prioritized processing paradigm). Mapping condition was varied between-subjects to be either matched (i.e., same SR rule for flankers as for center letters), reversed (i.e., opposite SR assignments for flankers), or neutral (i.e., different letters for flankers with separate

SR rules). The results indicated that the flanker effect is driven by a stimulus-based compatibility, as indicated by a significant flanker (stimulus) compatibility effect across the matched and reversed conditions, with little change in this effect across mapping conditions. Experiment 2 replicated and extended these findings to a psychological refractory period paradigm.

PS2.79. TESTING POTENTIATES NEW LEARNING, THE ROLE OF STRATEGY CHANGE AND LIST SEGREGATION

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Research on practice retrieval has largely focused on the enhancing effects that retrieving previously learnt materials has on memory, relative to restudy. Typically termed the backward testing effect, this benefit is robust and extensively studied (Rowland, 2014). Less well-known are the benefits that previous retrieval attempts have on subsequent new learning. Sometimes referred to as the forward testing effect, or test-potentiated new learning (TPNL), a growing body of research has demonstrated that retrieval practice of previously learnt materials can also enhance the subsequent learning of new materials (Chan, Meissner, & Davis, 2018). The current research explores the possible mechanisms underlying this effect and highlights both the direct and indirect benefits that retrieval has on potentiating new learning. In a series of experiments, list segregation and the ability to distinguish between information sources is explored as one possible mechanism.

PS2.80. THE ROLE OF ATTENTION AND MOOD FOR RE-REPRESENTING INSTRUCTED TASKS

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The present experiments explored whether participants would use an irrelevant stimulus dimension for responding that covaries with the instructed stimulus dimension. Stimuli consisted of compound global-local letters, with different letters featuring as global and local stimuli. Participants were required to respond either to the global or the local letter (Exp. 1; one letter identity dimension irrelevant but correlated), or to the location of the compound letters (Exp. 2&3; both letters irrelevant but correlated with each other and with position). Results show that, after practice, participants used global irrelevant letter identity, but not local irrelevant letter identity, for responding. Use of global letter identity tended to be more pronounced after seeing positive than neutral or negative pictures. These results

suggest that salient irrelevant stimulus features lead to shifts of attention and thus promote re-representation of instructed task rules. The decision to re-represent instructed tasks might be modulated by mood.

PS2.81. DIRECTING ATTENTION WITHIN VERBAL AND VISUO-SPATIAL WORKING MEMORY: WHEN DOES REFRESHING LEAD TO HEIGHTENED ACCESSIBILITY?

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Refreshing is a proposed mechanism to keep information active in working memory. The idea is that, as soon as attention is available, people direct their attention toward the representations of the to-be-remembered information in working memory, thereby reactivating the relevant working memory representations. Memory items that are brought into the focus of attention this way are assumed to be in a privileged state of heightened accessibility. In this study, we tested this presumed effect of directing attention, within verbal and visuo-spatial working memory. Through the use of refreshing cues, we guided attention sequentially from one working memory representation to the next. We probed working memory at different points in time, and tested whether probe response times show the presumed local effect of heightened accessibility for the just-refreshed item. Our results show that refreshing leads to heightened immediate accessibility for most, but not all, memory materials.

PS2.82. TRANSFER OF METACONTROL STATE TO CREATIVITY

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There is growing evidence that cognitive control states can vary both between and within people and that they can be systematically biased to promote either a more persistent or a more flexible control state. For instance, engaging in a convergent or divergent thinking task has been shown to differentially affect subsequent dual-task performance in accordance with the specific metacognitive state (persistent vs. flexible) induced by the prime task. We extended these findings by investigating whether convergent and divergent thinking could be affected by a specific metacognitive state induced by cognitive control tasks. In a two-session within-subjects design, participants performed a dual-task (experiment 1) or a task-switching task (experiment 2), modified to promote either a persistent or flexible processing style. The task was interleaved with a convergent

and divergent creativity task. Whereas the task-switching versions did not affect divergent nor convergent thinking performance, the dual-task versions did differentially affect convergent thinking performance.

PS2.83. ELECTROPHYSIOLOGICAL SIGNATURES OF SEMANTIC AND PHONOLOGICAL INTERFERENCE IN WORD PRODUCTION

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Both semantic and (non-onset) segmental overlap between target and competitors can lead to interference in word production. However, it is unclear whether the locus of phonological interference is lexical or segmental competition. We used a 2-item blocked cycling naming task, manipulating semantic (cake/pie) and phonological (tie/pie) similarity, with unrelated (hair/pie) pairs as control. Significant semantic and phonological interference was observed on durations, but not on accuracy or reaction times. Stimulus-locked ERPs revealed semantic and phonological effects between 230-350 ms post-stimulus, with a slightly later onset for the phonological effect. Both related conditions also showed differences from the unrelated before and around response generation in response-locked analyses. Early and overlapping effects of semantic and phonological similarity suggest a lexical locus of phonological interference through feedback. Later effects suggest downstream effects of competition all the way to response level.

PS2.84. OBJECT-BASED VISUAL WORKING MEMORY

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It is well-known that working memory has a limited capacity to maintain and process multiple pieces of information simultaneously. However, if the information is attributed to the same object or combined in a meaningful way, working memory capacity might be organized or used more efficiently (e.g., chunking). In the present study, we investigated whether maintaining multiple objects in visual working memory is more efficient if these objects are perceived as (part of) a single object instead of as separate objects. We conducted experiments in which performance relies solely on visual short term memory. Three grating orientations were simultaneously presented to participants to be memorized. Visual boundaries were drawn that either enclosed multiple gratings within a single object, or enclosed each grating independently. We tested memory performance under different experimental conditions, comprising different conjunctions of visual targets. The results

suggested that object-based presentation of information indeed improved visual working memory performance.

PS2.85. MOTOR SKILLS DO NOT AFFECT THE CHOICE OF ACTION IN CHILDREN WITH ATTENTION-DEFICIT HYPERACTIVE DISORDER

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The present study investigated motor skills in children with attention-deficit hyperactive disorder (ADHD) and its relation to their choice of action. A case-control study was conducted with 50 typically developing (TD) children and 30 children with ADHD, whose motor skills were evaluated by the standardized test. The choice of action was examined by using an experimental task, in which the subjects were asked to cross the rope at various heights by either stepping over or passing under it. As a result, motor skills in the children with ADHD were impaired compared to TD children. Children with ADHD were more likely to pass under the rope at a low height, while TD children rather chose to stepping over it at the same level. The threshold of the rope's height that subjects chose to pass under was predicted by their attention performance, but not by their motor skill performance.

PS2.86. A ROLE FOR THE CEREBELLUM IN SEMANTIC MEMORY: A TMS STUDY

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Several studies showed a cerebellar involvement in cognitive non-motor functions. Overall, prediction seems to be the underlying cognitive function linked to the cerebellum. It has also been argued that the same cognitive process might underlie prediction and memory. Several studies showed that memory and prediction share common neural substrates, but the cerebellar involvement in domains like these is not yet clear. We used TMS to investigate the role of the right cerebellar hemisphere (RCH) in semantic memory. We found that TMS over the RCH impaired participants' ability to recognize the meaningfulness of noun-adjective pairs. Specifically, TMS over the right hemisphere resulted in reduced accuracy of semantic meaningful word pairs such as "red apple" with respect to non-meaningful word pairs such as "federal cow" when compared to control conditions. Overall, our data suggest that the RCH

plays a causal role in semantic memory, thus suggesting common neural substrates for memory and prediction.

PS2.87. WHAT DO ERROR PATTERNS IN PROCESSING FACIAL EXPRESSIONS, SOCIAL INTERACTION SCENES AND VOCAL PROSODY TELL US ABOUT THE WAY SOCIAL COGNITION WORKS IN CHILDREN WITH 22Q11.2DS?

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Impairments in social cognition have been frequently described in 22q11.2 deletion syndrome (22q11.2DS) and are thought to be a hallmark of difficulties in social interactions. The present study addresses aspects that are critical for everyday social cognitive functioning but have received little attention so far. Sixteen children with 22q11.2DS and 22 controls completed one task of facial expression recognition, one task of contextual emotion recognition, and one task of vocal emotion recognition. All three tasks have in common to involve processing of emotions. All participants also completed neurocognitive tasks, and their parents completed some scales regarding behavioural problems of their children. Patients with 22q11.2 DS had significantly lower results in the three components of social cognition assessed. An isolated association between the tasks of emotion and behaviour was found, showing that the more frequently patients with 22q11.2DS perceive happiness where there is not, the less they exhibit aggressive behaviour.

PS2.88. HIGH SPATIAL FREQUENCIES DOMINANCE FOR VISUAL CONSCIOUSNESS SUGGESTED BY AN ATTENTIONAL BLINK PARADIGM

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The present study investigated the influence of the spatial-frequency content of emotional face stimuli on exogenous consciousness, by manipulating distractors over an attentional blink paradigm. During a rapid serial visual presentation, participants had to detect two targets of happy faces

(T1 and T2) among angry faces distractors, which were either non filtered (Broad Spatial Frequencies - BSF), low-pass filtered (Low Spatial Frequencies - LSF) or high-pass filtered (High Spatial Frequencies - HSF). Contrary to our predictions, HSF distractors generated a greater disturbance on T2 detection, resulting in a more pronounced attentional blink, compared to LSF distractors. These results can account for the importance of HFS processing in visual exogenous consciousness. We are currently using this paradigm with autistic participants as a locally oriented visual processing and an atypical processing of spatial frequencies have been reported in this population.

PS2.89. IRRELEVANT MUSIC: HOW CHANGES OF TEMPO AND MODE OF MELODIES AFFECT THE DISRUPTIVE POTENTIAL OF MUSIC ON SERIAL RECALL

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On tests of verbal working memory, performance declines as a function of auditory distraction. The negative impact of to-be-ignored sound on serial recall is known as the irrelevant sound effect. Moreover, sound that changes acoustically from one token to the next is more disruptive than repetitive, steady-state sound. We tested suprasegmental changing-state manipulations for complex tonal stimuli by using variations of the first bars of a well-known melody. Within a trial, the melody was repeated in the exact same manner, with variations only in tempo, with variations only in mode, or with variations in both tempo and mode. Non-music students (Experiment 1) and students majoring in music (Experiment 2) serially recalled digits in each of the irrelevant sound conditions and in a silent control condition. Across both experiments, recall in the irrelevant sound conditions significantly differed from the silent condition, but only the tempo variation further reduced recall performance.

PS2.90. INTUITIVE JUDGMENTS DEPEND ON BOTH PERCEPTUAL/PROCESSING FLUENCY AND TIME PRESSURE

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Intuitive judgments are basic and primary mode of cognitive processing. They are defined as fast and frugal decisions that do not require higher-order cognitive processes but nevertheless provide important information about the stimuli. In two experimental studies (N = 32 and N = 40) we used Triads Task in which participants were asked to provide the solution to three semantically associated words

or, if unable, to determine the Triad solvability. Affective valence of solutions was controlled and visual contrast was manipulated. We confirmed previously reported effects of solutions' valence in that Triads with positive solutions were solved and judged as solvable more accurately than Triads with negative or neutral solutions. Moreover, this basic effect was more pronounced for Triads presented in high vs. low visual contrast. Finally, contextually induced need for cognitive closure (via time pressure) moderated intuitive judgments in that visual contrast effects were attenuated under time pressure.

PS2.91. ON THE COGNITIVE ORIGINS OF CUMULATIVE TECHNOLOGICAL CULTURE

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The term cumulative technological culture is used to describe the way that human populations over time have gradually accumulated techniques that are too complex to be invented by a single individual. Cumulative technological culture is driven by two engines: Imitation (faithful copy of a trait) and innovation (improvement of a trait). To date, the emphasis has been mainly on the imitative component. The rationale is that faithful social transmission can work as a ratchet to prevent slippage backward so that the newly invented technique can be subsequently improved. In line with this, the literature has proposed that social, cognitive skills could support the imitative component (e.g., theory of mind). Here we present experimental evidence from micro-society paradigms (i.e., transmission chains) that question this social, cognitive approach, by showing that individuals' technical-reasoning skills might be the necessary cognitive skills at the origins of cumulative technological culture.

PS2.92. EMOTION EFFECT ON TASK IRRELEVANT LEARNING
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Task-irrelevant learning (TIL) refers to the phenomenon where stimulus features of a subject's task that are presented at relevant point in times are learned (Seitz & Watanabe, 2009). In the present experiments, we aimed to test the effect of emotion on TIL. Indeed, in the memory literature, studies indicate that emotion-laden information influences memory (Mather & Sutherland, 2011). To test the effect of emotion on TIL, we used the fast-TIL paradigm (Leclercq & Seitz, 2011) where subjects perform an RSVP task in which we varied the emotional valence of the

target. Our results indicate a larger TIL with a positive target compared to a negative and a neutral target, but no difference in TIL between negative and neutral targets. Impact of positive emotion on TIL could be explained by the fact that positive emotions lead to a broadening of attention on irrelevant information (Fredrickson & Branigan, 2005).

PS2.93. EMOTION INFLUENCES PROCESSING AND MAINTENANCE COMPONENTS OF WORKING MEMORY.

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It was suggested that emotional stimuli may interfere with working memory processes. Our previous study (Plancher et al., 2018) showed deleterious influence of processing of negative emotional content on attentional maintenance in working memory of neutral information. Because the task was performed under articulatory suppression, we proposed that emotional stimuli direct more attentional resources towards the processing component of working memory, thereby reducing the storage capacity available for the to be remembered items. In the present study, our goals were to¹ replicate the influence of processing negative content on attentional maintenance of non-emotional information (Exp 1), and² examine whether maintenance of negative information as compared with emotionally neutral one's disturbs processing of neutral content (Exp 2 in progress). The results from Experiment 1 confirm our suggestion that processing emotional information captures more attentional resources and thus reduces storage capacity in working memory.

PS2.94. IF COMMON MECHANISMS OF RESPONSE INHIBITION EXISTED, WOULD WE BE ABLE TO DETECT THEM?

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It is often assumed that individual differences in a general response inhibition ability underlies performance across different tasks (e.g. Stroop, Eriksen flanker, antisaccade). However, recent work has cast doubt on this by failing to reproduce widely cited factor-analytic models. One obstacle in this area is that traditional behavioural measures can be confounded by non-conflict processes, such as strategy and processing speed. Here, we evaluate the extent to which we are able to detect correlations between conflict tasks when we know they exist. We incorporate a range of approaches including different variants of the same task, cognitive modelling, simulations, and the use of composite measures of reaction time and accuracy. These converge

on a common conclusion that non-conflict processes contribute substantially to individual differences in behaviour in conflict tasks, making it difficult to draw conclusions about inhibition specifically.

PS2.95. THE RELATIONSHIPS BETWEEN EFFORT COSTS, MOTIVATION AND COGNITIVE CONTROL PERFORMANCE: A STRUCTURAL EQUATION MODELING APPROACH
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In Cost-Benefit Decision Making models of cognitive control (CBDM) failures and successes of control do not appear due to the inability of an individual to exert control, but due to decisions motivated by computations weighing costs and benefits of a given activity. The aim of the study (N=247) was to examine in detail the relationships between one of the focal costs enumerated in such models, i.e. the cognitive effort cost (CEC), and the set of variables which should be related to the extent to which it affects cognitive control task performance i.e. self-control, cognitive capacity, lay theories of willpower and motivation. Some of these variables were shown to be related to CEC, but in smaller, separate studies. We tested a theoretical model positing moderated mediation using structural equation modeling and conditional process analysis. The model and its importance for CBDM will be discussed.

PS2.96. EVALUATING EXECUTIVE FUNCTIONS IN CHILDREN WITH ACADEMIC TALENT

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In the last years, the abilities of academic talent (AT) and the difference with other type of talent or high intellectual capacity are still debating and few studies have evaluated the relation between AT and executive functions. The present study aimed to assess the efficiency of executive functions in a sample of children between 11 and 12 years with AT attending to PROENTA-UFRO after-school enrichment program, comparing to a sample of children without AT. Intellectual quotient and academic performance were considered. To evaluate executive functions, a battery for neuropsychological assessment of executive functions in children (ENFEN) was administered. Results indicate that children with AT show a better performance in functions such as working memory, planning, inhibitory control, mental flexibility, as respect children without AT. By contrast, no difference between groups was found as respect to phonological fluency, a component related to vocabulary and cultural level of children.

PS2.97. FEAR OF MISSING OUT AND ATTENTIONAL CAPTURE BY DISTRACTORS ASSOCIATED WITH SOCIAL REWARD

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On the one hand, stimuli paired with social reward can capture attention even when their processing is irrelevant to, or even detrimental for the task at hand. On the other hand, individual differences exist in how we respond to social reward, and the role of the individual's Fear of Missing Out (FoMO) in getting involved in social reward seeking behaviors has recently been the subject of particular interest. The current study investigated whether FoMO could predict attentional capture by socially rewarded distractors. Participants performed a visual search task on ecological driving pictures in which stimuli previously associated with social reward (neutral or smiling faces) appeared as distractors on a smartphone screen. Individual FoMO scores positively predicted attentional capture by high-reward stimuli, but only under situations favorable to distraction (foggy scenes). Individual and contextual factors therefore seem to interact to determine whether or not distraction by socially rewarded stimuli will occur.

PS2.98. FERPER: EVALUATING EMOTION RECOGNITION CAPACITIES THROUGH FACE AND VOICE

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Emotion Recognition (ER) deficits have negative repercussions on the quality of social behaviour. Many ER tests are interested in evaluating facial ER whilst others use multiple modalities presented simultaneously. We have elaborated a battery of ER evaluation, FERPER, which allows estimating the severity of ER in facial and prosodic modality separately. The battery is composed by two tests, each separated in two subtests, all presenting happiness, sadness, fear, disgust and anger. FER consists of presenting 20 photos of men and women. On the first subtest, the participant is asked to give the emotion presented in the photo and a figurative event which produced the emotion. The second subtest is presented identically as the first with the proposal of a list of 5 emotions and multiple lists of events. PER is identical to FER but with "paper" pronounced

instead of photos. Control group and two case studies results are in process.

PS2.99. AN UNDENIABLE INTERPLAY: BOTH NUMEROSITY AND VISUAL FEATURES AFFECT ESTIMATION OF NON-SYMBOLIC STIMULI

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Converging lines of evidence suggest that our numerical abilities are rooted in the approximate number system: an innate, non-verbal mechanism that enables to estimate the numerosity of groups of elements. Nevertheless, the correlation between visual features and numerosity in the natural environment poses an important methodological confound. In the present study we implemented a non-symbolic estimation task which included a calibration phase. After performing a pre-calibration block, participants were divided in three groups, according to the calibration stimulus they attended to: the numerosity of the three calibration was the same, but three visual features were different. Results showed that performance was affected by numerosity and visual features in both blocks; nevertheless, calibration markedly increased sensitivity to numerosity while decreasing sensitivity to visual features. The present findings cannot be reconciled with theories that account for human performance in non-symbolic number processing as solely dependent on numerosity or visual features.

PS2.100. SHORT STRUCTURED EXPRESSIVE WRITING DECREASES ANXIETY IN JUNIOR HIGH SCHOOL STUDENTS.

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Short expressive writing is an effective intervention for performance anxiety (e.g., test anxiety). However, it is unavailable for junior high school students, because their emotional regulation skills are relatively undeveloped. Therefore, we made the short expressive writing structured adaptively for junior high school students. This 30-minute short structured expressive writing intervention was implemented with 35 junior high school students. The results showed that the intervention decreased their anxiety and negative mood. In addition, we investigated the individual differences in the intervention effect. In the group with low working memory capacity, students with high self-efficacy showed greater effects than those with low self-efficacy. In contrast, students with high working memory showed no significant differences concerning self-efficacy. In conclusion, this study indicates that short

structured expressive writing is a valuable intervention for junior high school students; however, the effect of the intervention was influenced by individual differences of working memory and self-efficacy.

PS2.101. THE ROLE OF COGNITIVE ABILITIES IN SPEECH PERCEPTION UNDER COGNITIVE LOAD: AN INDIVIDUAL DIFFERENCES APPROACH

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This study examines how and to what extent speech perception abilities are modulated by increased cognitive load and whether individuals differ in the extent to which they adjust their cue weighting strategies in the utilization of multiple acoustic cues under cognitive load. This study also investigates whether individuals' cue weighting strategies are related to their cognitive abilities under cognitive load. Native English listeners (N=54) were engaged in a dual task in which they completed a two-alternative forced choice identification task with concurrent visual search. Participants also completed cognitive tasks examining working memory and inhibitory control. Results revealed that listeners' cue weights were overall modulated under cognitive load, but there were large individual differences in this process and these differences were associated with individuals' cognitive abilities. That is, individuals with better working memory and inhibitory control showed more increases in cue weights than those with poorer working memory and inhibitory control.

PS2.102. BEHAVIOURAL AND NEURAL CORRELATES OF VISUAL WORD LEARNING

Viviani, E.¹, Vidal, Y.², & Crepaldi, D.³
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We learn new words via our everyday reading experience, but the precise mechanisms behind this learning are still unclear. In this experiment we tracked the development of lexical representations in adults combining behavioral measures of lexical processing with EEG signatures of visual and auditory word sensitivity. Participants learned novel letter strings using two different routines, one based on the standard explicit procedure typically used in the literature, and one based on a more pro-active, feedback-based learning. Lexical integration was measured immediately after learning, and one day and one week post-learning. The two different learning methods proved to be equally effective. Participants showed lexical integration of novel word forms both in the behavioural and in the visual EEG task, suggesting that the brain becomes sensitive to

lexical representations as it gets repeatedly exposed to written strings of letters, but that this learning doesn't transfer to the auditory domain.

PS2.103. LEARNING A NEW LANGUAGE AT OLDER AGES: NEURO-COGNITIVE AND PSYCHOLOGICAL WELLBEING EFFECTS

Lin, Y.¹, Wei, D.², & Gillon Dowens, M.³

1 University of Nottingham Ningbo China, China; 2 Lanzhou Jiaotong University, China, & 3 University of Nottingham Ningbo China, China

This study focuses on the degree of neuroplasticity in older adults learning a new language, by measuring the electrophysiological brain patterns of older English learners in China who are retired and have been learning English at local Universities for the Third Age. Their responses to grammatical and semantic irregularities embedded in English sentences were recorded and compared to those of age-matched native speakers and young adult learners of English. The resulting EEG patterns of response, in terms of the P600 and N400 ERP components, provide evidence about the degree of brain plasticity for language learning available in these older learners. The study also sheds light on other impacts of the experience of learning a language at older ages, in terms of psychological well-being and other cognitive and affective factors.

PS2.104. BILINGUALISM AND VERBAL SELF-REGULATION: CONSEQUENCES OF LANGUAGE BACKGROUND AND TASK DIFFICULTY FOR PRIMARY SCHOOL STUDENTS' PLANNING PERFORMANCE

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1 University of Leipzig, Germany; 2 University of Koblenz-Landau, Germany

To further our understanding of the so-called "bilingual advantage", the presented study investigated the role of verbal self-regulatory strategies during a planning task in a sample of monolingual and bilingual primary school students. Furthermore, differential effects of task difficulty and language competencies were analysed. Bilingual German-Russian speaking students (n=34, Mage=8.88) and monolingual German speaking students (n=33, Mage=8.78) completed a computerized version of the Tower of London task (Shallice, 1982) in three different experimental conditions: a regular condition, a tapping control condition and an articulatory suppression condition. The latter included an additional verbal task to suppress inner verbal processes (Lidstone, Meins, & Fernyhough, 2010). Results show that both mono- and bilingual

students do not generally rely on verbal self-instruction when solving a planning task. However, especially in more difficult tasks, bilingual children seem to be less impaired by additional verbal demands, confirming assumptions resulting from relevant theoretical work.

PS2.105. LEARNING NEW WORDS BY READING STORIES: DOES SEMANTIC INFORMATION HELP?

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Université Libre de Bruxelles (ULB), Belgium

The encounter of an unknown word is a common experience of any adult reader. To be learnt and easily recognized in the future, the unfamiliar letter string has to enter the mental lexicon, the system of interconnected representations (orthographic, phonological, semantic) of words. Most studies examined only one of these aspects, so a clear picture of the cognitive dynamics of this learning is missing. The aim of our study was to examine the effect of semantic information on word learning in adults using an original approach based on learning via a naturalistic situation of story reading. Different aspects were examined: orthographic, phonological, and semantic knowledge on novel words (spelling, naming, and word meaning recognition task), and the integration of the novel words into the mental lexicon (primed LDT). The performance in the four tasks was compared according to the semantic context provided for the new words in the stories.

PS2.106. SIMILARITY OF BRAIN ACTIVITY PATTERNS DURING ON-LINE AND OFF-LINE PERIODS OF PROCEDURAL LEARNING PREDICTS MEMORY CONSOLIDATION

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The replay of previously established neuronal activity patterns is critical for memory consolidation, yet empirical studies in humans on it are scarce. Our aim was to find similarities in the brain dynamics (measured via EEG of 32 healthy young adults) between on-line (learning) and off-line (post-learning quiet rest) periods of procedural memory. We used the cued version of the Alternating Serial Reaction Time Task, which measures both statistical learning (probability information) and sequence learning (serial-order information). To measure similarity between the brain dynamics, we calculated Euclidean distance of all-to-all functional connectivity matrices between on-line and

off-line periods. We found that subjects with more similar connectivity matrices in the alpha (~10 Hz) frequency band had better consolidation of sequential, but not of statistical knowledge. These findings indicate that spontaneous cortical replay facilitates procedural memory consolidation only in case of serial order information and not in probability information.

PS2.107. CROSSMODAL AND UNIMODAL SHORT-TERM MEMORY BINDING TASKS ARE NOT DIFFERENTIALLY AFFECTED BY AGE.

Guazzo, F.^{1,2}, Baddeley, A.D.³, Allen, R.⁴, & Della Sala, S.¹
 1. *University of Edinburgh, UK*; 2. *Università degli Studi Suor Orsola Benincasa, Italy*; 3. *University of York, UK*; 4. *University of Leeds, UK*

Short-Term Memory Binding (STMB) entails the integration of multiple sources of information to form and temporarily store unique representations. Information can be processed through either one (i.e., unimodal STMB) or separate sensory modalities (i.e., crossmodal STMB). In two experiments we investigated whether crossmodal STMB is differently affected by age compared to unimodal STMB. Experiment 1: 26 older and 26 younger adults performed a cued-recall paradigm involving a series of three to-be-studied colour-shape bindings (visually presented in the unimodal condition; auditorily and visually presented in the crossmodal condition), before recalling the target feature matching the test probe to complete the previously displayed combination. Experiment 2: 34 older and 33 younger adults undertook the same paradigm while carrying out articulatory suppression to limit verbal recoding. Results show no age-related cost in crossmodal STMB in respect to unimodal STMB. This suggests that crossmodal STMB does not require additional age-related resources to be performed.

PS2.108. DEVELOPMENT OF ATTENTIONAL NETWORKS FROM CHILDHOOD TO ADOLESCENCE AND ADULTHOOD

Giovannoli, J.¹, Martella, D.², & Casagrande, M.¹
 1 *University of Rome "Sapienza", Italy*; 2 *Autonomous University of Chile, Chile*

The Attentional Network Test for Interaction and Vigilance is an experimental task which allows assessing the three attentional components (alerting, orienting, executive control) and their interactions simultaneously. This study aimed to evaluate the development of the attentional networks comparing children (N: 17; age 6-10 years), pre-adolescents (N: 53; 11-14 years), adolescents (N: 104; 15-18 years) and young adults (N: 57; 19-24 years). The results

showed that reaction times became faster with increasing age. No significant effects for age group were observed for alerting and orienting effects while the Conflict effect significantly changed. Specifically, the attentional conflict resolution improves from children to pre-adolescents after which it remains stable in adolescents and adults. These findings highlight that the tonic alertness (i.e., global reaction times) and the ability to solve conflictual information develops later respect to phasic alerting and orienting systems.

PS2.109. PSEUDO-LETTER CHUNKING IN NOVEL WORDS THROUGH PROBABILISTIC INFORMATION

Lelonkiewicz, J.R., Ktori, M., & Crepaldi, D.
International School for Advanced Studies (SISSA), Italy

Visual word identification appears to be sensitive to probabilistic information: Readers group frequently co-occurring letters into chunks (e.g., morphemes) and code for their typical position within words. Using an artificial script, we examined the nature of this chunking mechanism. Participants were first exposed to a lexicon of pseudo-letter strings, each composed of a stem-like chunk that was either followed (Experiment 1; n=70) or preceded (Experiment 2; n=69) by an affix-like chunk. In the absence of any linguistic information, chunks were defined by the probability with which they occurred in the novel lexicon. In a later testing phase, participants were more likely to attribute a previously unseen string to the novel lexicon if it contained an affix, and if the affix appeared in its typical position. These findings suggest that readers may chunk words using a general, language-independent cognitive mechanism that captures statistical regularities in letter co-occurrence.

PS2.110. METACONTRAST MASKING AND BOTTOM-UP ATTENTIONAL CONTROL

Baier, D., Goller, F., & Ansorge, U.
University of Vienna, Austria

Both spatial attention and visual masking are involved in the selection and processing of stimuli. To clarify if these mechanisms work independently or interact, we conducted two experiments, combining metacontrast masking and bottom-up attention capture. As expected, we found better performance in the discrimination of masked stimuli if they were color singletons (in line with bottom-up capture by salient color), as well as the characteristic u-shaped distribution of discrimination accuracy as a function of the stimulus onset asynchrony between stimuli and masks in Experiment 1. To validate that the color singletons indeed

captured attention, we included a spatial cueing task preceding the target discrimination task in each trial in Experiment 2. We replicated the results of Experiment 1 and additionally found validity effects depending on the position of the color singletons. This argues for an interaction of metacontrast masking and bottom-up attentional control.

PS2.111. THE INFLUENCE OF INFLECTIONAL AND DERIVATIONAL MORPHOLOGY IN GRADE 3 AND 5 CHILDREN TO SPELL NEW WORDS

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1 Univ. Paris Descartes, France; 2 Univ. Grenoble Alpes, CNRS, France

Implicit learning of new spellings in French 3rd and 5th graders benefits from morphological relatedness beyond orthographic relatedness (Pacton et al., 2018, JECp). For example, children learned better the spelling of the morphologically simple nonword 'coirard' when its final silent d is pronounced in two morphologically complex nonwords: 'coirarde', with the inflection 'e', and 'coirardage', with the derivation 'age'. This design did not allow us to assess whether the morphological benefit differs for inflectional and derivational morphology. In this study, the morphologically complex nonwords were derived for some children and inflected for others. A morphological benefit was found for the two types of morphology in Grade 5, but only for inflectional morphology in Grade 3. This result is in accordance with studies showing that children rely earlier on inflectional than derivational morphology to spell real words (Deacon & Bryant, 2005, Dev Science).

PS2.112. AUDIENCE EFFECT IN DOGS: BEHAVIORAL MEASURES AND SLEEP EEG MONITORING

Kiss, O.¹, Kis, A.², & Topál, J.³

1 Hungarian Academy of Sciences, Hungary; 2 Budapest University of Technology and Economics, Hungary

An audience effect arises when the presence of an attentive partner influences a subject's behavior. Although dogs have been shown to possess infant-like sensitivity to the human's attentional state, it is unclear if they are susceptible to audience effect. In this study, we investigated (i) whether dogs' performance would vary according to the visual attention of their owners and (ii) whether differences in susceptibility to audience effect correlate with the spectral characteristics of sleep EEG in dogs. Adult pet dogs (N=28) were asked repeatedly to retrieve a toy object, and they also participated in 3-hour long polysomnography recordings. Our results indicate that dogs recognize their owner's attentional states while performing and modify

their behavior accordingly and we also found relationships between subjects' task performance and some aspects of the sleep EEG spectrum. These findings suggest that a functionally human analogue form of audience effect may have emerged in dogs.

PS2.113. LACKING CONTROL INCREASES CREATIVITY

Mulatti, C. & Treccani, B.

University of Trento

In two experiments, we investigated whether the feeling of lacking control can foster creative thinking, which we operationalized as the ability to produce associative and dissociative combinations of either related and unrelated concepts. Participants were asked to think about an incident in their life wherein they felt either to be in control or to lose control of the situation. Immediately afterwards, they had to perform five different creative (divergent) thinking tasks. In both experiments, we observed higher scores in all creativity tasks for participants who recalled loss-of-control events than for those recalling in-control events. Our findings suggest that compensatory processes, triggered by loss of control, can promote divergent thinking.

PS2.114. FAR-TRANSFER OF METACONTROL

van Dooren, R., Sellaro, R., & Hommel, B.

Leiden University, The Netherlands

According to the Metacognitive State Model, human behavior can be described in terms of two counteracting systems: one promoting persistence, the other promoting flexibility. The ability to shift the balance between these two opposing systems is referred to as metacognitive control. In recent years, the question has arisen how the cognitive system knows when and how to regulate this balance in order to meet changing situational requirements. One theoretically attractive possibility has been proposed, suggesting that control parameters can become conditioned to contextual information. With four experiments, we show that general control states can indeed become associated with specific contextual information. More specifically, cued retrieval of established control sets can outlive the task they have been established for, indicating that general control states can (far-)transfer to entirely different task contexts. These results highlight the importance of contextual information in shifting the metacognitive balance towards one or the other cognitive control dimension.

PS2.115. TOWARDS A DEEPER UNDERSTANDING OF DENSITY IN NON-SYMBOLIC NUMEROSITY PROCESSING

De Marco, D. & Cutini, S.

University of Padova, Italy

When investigating processing of numerosity with non-symbolic stimuli, visual features of the stimuli are a crucial methodological aspect, because they can heavily bias human performance; among many others, the density of the elements composing the stimuli is one the most influential visual features. Puzzlingly, two conceptually different formulas are commonly used to describe density, and none of them seems to adequately capture all the relevant aspects of the stimuli. In the present study we tested the validity of these measures as well as the soundness of other novel measures of density. Participants briefly looked at non-symbolic number stimuli and had to estimate perceived density through a visual analog scale. Results showed that the currently available measures of density do not adequately represent the perception of participants: future studies should acknowledge the fact that the perception of density might be intrinsically characterized by a conspicuous inter-individual variability.

PS2.116. EXPLORING THE MECHANISMS UNDERLYING SEMANTIC PRIMING WITH DISTRIBUTIONAL SEMANTICS

Nadalini, A.¹, Bottini, R.², Marelli, M.³, & Crepaldi, D.⁴

1 International School for Advanced Studies, Italy; 2 University of Trento, Italy; 3 University of Milano Bicocca, Italy; 4 International School for Advanced Studies, Italy

Access to word meaning outside of awareness is generally accepted now, at least as indexed by masked priming. Yet, it is not clear what kind of information is grasped subliminally, and whether the mechanisms underlying conscious and unconscious semantic processing are the same. Here, we address this issue by comparing the state-of-art Distributional Semantic Model (DSM) with Pointwise Mutual Information (PMI), a measure of association between words based on their mere co-occurrence in language use. In particular, we test whether the two metrics predict facilitation in a dataset comprising visible and masked primes, and different stimulus onset asynchronies between primes and targets. Subliminally, we find no significant effect, although participants with better prime detection show larger priming. Supraliminally, PMI outperforms DSM in the fit to the behavioral data. According to our results, semantic priming may mostly be explained in terms of association between words as reflected in their co-occurrence patterns.

PS2.117. PREDICTING WHILE COMPREHENDING SPOKEN SENTENCES: WHAT IS THE INFLUENCE OF SPEAKERS' COMMUNICATIVE INTENTIONS ON PREDICTIONS?

Brunellière, A. & Delrue, L.

University of Lille, France

People may predict upcoming words when they listen to spoken sentences and prediction is seen as the key mechanism for insuring the successful communication. However, evidence pointing to the predictive mechanisms which might take into account speakers' communicative intentions is lacking so far. By measuring event-related potentials on gender-marked French articles, the study aimed to investigate whether the prosodic emphasis conveying speakers' communicative intentions can affect lexical predictions. During the listening of spoken sentences, differences in ERP amplitudes measured on prediction-consistent versus inconsistent articles preceding the expected noun were found. The prediction effects occurred earlier and persisted later when sentence were produced with emphasis. In a judgment task on the speaker's communicative intention, the prediction effects on articles in prosodic emphasis contexts occurred even earlier than those in passive listening task. Hence, the speaker's communicative intention can affect lexical predictions and this adaptation depends on how listeners analyze the sentences.

PS2.118. CHANGES THROUGHOUT AGE IN SENSITIVITY TO MARKEDNESS

Borraran, M.¹, de Bruin, A.¹, Casaponsa, A.², & Duñabeitia, J.A.³

1 Basque Center on Cognition, Brain and Language (BCBL), Spain; 2 Lancaster University, UK; 3 Universidad Nebrija, Spain.

Bilinguals whose languages share similar scripts may rely on orthotactic cues to recognize the language of the words they read in ambiguous contexts. Previous research has shown that marked words with language-specific letter sequences (i.e., letter sequences that are illegal in one of the two languages) are faster and easier to recognize than unmarked words (Casaponsa, Carreiras, & Duñabeitia, 2014). The aim of this study was to investigate the sensitivity to markedness throughout the lifespan by using a speeded language decision task. Four groups of Spanish-Basque bilinguals of different age were tested (children, pre-teenagers, teenagers and adults). Results showed a markedness effect across all groups. However, the sensitivity to the orthotactics of the languages does not follow a linear trend and it appears to remain stable from early adolescence onwards.

PS2.119. ASSESSING COGNITION AND FUNCTIONAL ABILITY IN EVERYDAY-LIFE CONTEXT

von Bastian, C.C.¹, McNab, F.², Stone, J. M.³, Stafford, T.¹, Locher, A.⁴, Pavlidis, G.⁵, Baddeley, A.D.², & Allen, R.J.³

1 University of Sheffield, UK; 2 University of York, UK; 3 University of Leeds, UK; 4 Tootool Web, UK; 5 International Faculty of the University of Sheffield, Greece

To meet the societal challenge of successful ageing, the WHO recently proposed a focus-shift from disease and symptoms to functional ability enabling wellbeing in older adults. Functional ability -- to be and to do what the individual values -- is determined by physical and mental ability, situational context, and interactions thereof. Yet, little is known about variability in and predictors of functional ability in older adults and how they relate to everyday-life competence, especially concerning age-related cognitive declines. In this study, we tested the feasibility and usability of Tootool XP, a novel mobile application, to assess cognition, functional ability, and contextual variables in older adults' everyday-life by combining experimental methods with experience-sampling techniques. Data on feasibility and usability of the application will be presented, and implications of the method for longitudinal and cross-cultural assessment will be discussed.

PS2.120. ORTHOGRAPHIC LEARNING OF NEW WORDS: FROM LOOKING TO MEMORIZING

Ginestet, E., Bosse, M.L., Diard, J., & Valdois, S.

Laboratoire de Psychologie et NeuroCognition, France

While conceptual models of orthographic learning postulate that visual word analysis is a necessary step when processing a new written word, few studies have examined eye movements during the reading of new words and their implicit memorization. The present study on French expert readers examined the evolution of eye movements when new isolated 8-letter words were read, from their first to their fifth exposure. Following this reading phase, a recall task and a recognition task were used to measure the quality of their orthographic memorization. Further, their visual attention span was estimated. Results show that the memorization of new words' orthography increases with exposures. The analysis of eye movements reveals that both the number and the duration of fixations significantly decrease as a function of exposures. Moreover, this decrease differs according to the participants' visual attention span. Current findings provide new insights for future computational models of reading acquisition.

PS2.121. THE ROLE OF FACIAL EXPRESSIONS IN COMMUNICATION: THE CASE OF PREJUDICE

De Simone, F., Collina, S., & Nuzzo, M.

University of Naples Suor Orsola Benincasa, Italy

The aim of this study was to test the role of non-verbal cues in understanding communicative acts. In the experiment participants were requested to observe a silent video. The video was composed by three clips: one showing racial prejudice, one focused on sexual prejudice and a control clip. During the task participants facial expressions were recorded to recognize emotional states with FaceReader software. At the end of the video participants were asked to indicate the type of behavior they observed and the non-verbal cues they mostly focused on. The prejudice was correctly recognized by 80% of participants mainly focusing on facial expressions (97%). On the base of FaceReader data, racial prejudice elicited disgust, sexual prejudice aroused anger. The data suggest an interplay between encoding and decoding processes also when participant are observers and not actors in communication. The results will be discussed in light of reliable models of communication.

PS2.122. THE ROLE OF EMOTIONAL UNDERSTANDING IN CHILDREN'S ALTRUISTIC LIE-TELLING

Demedardi, M. J.¹, Brechet, C.¹, Gentaz, E.¹, & Monnier, C.²

1 Univ Paul Valéry Montpellier 3, Montpellier, France; 2 Faculty of Psychology and Educational Sciences, Geneva, Switzerland

Recent studies have shown that from an early age children are able to tell altruistic lies (i.e., lie for the benefit of others). However, the factors involved in the development of this ability are still poorly understood. The current study examined children's emotional understanding in relation to altruistic lying among 4- to 11-years old children. Altruistic lying was observed using a situation in which children were invited to play a game with a confederate. While the child won all the rounds, he was asked to pretend that he had lost the last one so as the confederate could get a reward. To assess emotional understanding, children's parents completed the Griffith Empathy Measure (Dadd et al., 2008), a brief parent-report measure of empathy. Furthermore, children completed the Test of Emotion Comprehension (Pons & Harris, 2000). We expected children with greater emotional understanding to be more likely to tell altruistic lies.

PS2.123. VIVIDNESS OF FACIAL CONTEXT DIFFERENTLY AFFECT PLAUSIBILITY JUDGEMENT OF FIGURATIVE EXPRESSIONS

Kim, H. & Lee, D.

Pusan national University, South Korea

In the current research, we examined a hypothesis that figurative expressions are more plausible to describe vivid emotional context. To manipulate the vividness of context, colored faces was used such as reddish for angry faces and bluish for fearful faces as the congruent condition. For the incongruent condition, the opposite colors were matched and the neutral color was used as well. In the task, faces were presented before figurative expressions and participants were instructed to judge whether the language is plausible to describe the face. Fitting a GLMM includes emotional category (angry/fear) and facial colors (congruent/neutral/incongruent) as fixed effects. The interaction between emotional category and facial colors was marginal significant. When fearful figurative expressions described vivid facial expression, the ratio of plausibility judgment was higher than neutral and incongruent condition. Current results suggest that the plausibility of figurative expressions is affected by the vividness of the facial context.

Poster session 3

Espejos Hall

Friday 27th
17:20-18:50

PS3.1. PREDICTION-BASED MEMORY CONTROL: TASK PREDICTABILITY ENABLES TOP-DOWN CONTROL OVER THE RETRIEVAL OF ITEM-SPECIFIC STIMULUS-CLASSIFICATION ASSOCIATIONS

Pfeuffer, C.

University of Freiburg, Germany

Task predictability reduces task switch costs and leads to improved performance. Recently, it was demonstrated that a stimulus' task-specific semantic classification, becomes associated with the stimulus independent from the given response. Here, I examined whether explicit pre-knowledge about the classification task one would have to perform on a stimulus led to top-down control over the corresponding item-specific stimulus-classification (S-C) association. Performance costs associated with an item-specific switch in S-C mapping between a stimulus' prime (encoding) and probe (retrieval) instance were modulated by the predictability of the classification task. Importantly, this was also the case when the probe classification task was not already known to participants during the prime phase. This implies that task predictability was used to exert top-down control over the retrieval and not encoding of S-C associations.

PS3.2. REDUCED INDIRECT SEMANTIC PRIMING IN DISORGANIZED SCHIZOTYPY

Rodríguez-Ferreiro, J.¹, Aguilera, M.C.¹, & Davies, R.²

1 Universitat de Barcelona, Spain; 2 Lancaster University, UK

Thought disorder in schizophrenia has been linked to semantic disturbances observed as increased spreading of semantic activation in sub-clinical individuals with high scores in schizotypal personality questionnaires. We conducted two priming experiments with volunteers varying in schizotypy, one with directly related prime-target pairs and another study with indirectly related pairs. Our participants completed a lexical decision task with related and unrelated pairs presented at short (250ms) and long (750ms) stimulus onset asynchronies (SOAs). Then they responded to the Schizotypal Personality Questionnaire-

Brief. Along with significant effects of semantic relatedness and SOA, our analyses indicated a negative relation between the indirect priming effect and the disorganized dimension of schizotypy at the short SOA. While this study confirms the presence of abnormal semantic processing in high schizotypes under certain conditions, our results contradict previous observations indicating further-reaching spreading of semantic activation in these individuals.

PS3.3. SEMANTIC INTEGRATION OF NEW VOCABULARY: DOES LEARNING CONTEXT MATTER?

Korochkina, M.^{1,2,3}, Bürki, A.², & Nickels, L.³

1 International Doctorate for Experimental Approaches to Brain and Language (IDEALAB): Universities of Groningen (The Netherlands), Newcastle (United Kingdom), Potsdam (Germany), Trento (Italy) & Macquarie University (Australia); 2 University of Potsdam, Germany; 3 Macquarie University, Australia

Introducing new vocabulary in semantic categories has long become the gold standard in second language teaching, even though empirical evidence seems to suggest that this practice might have a detrimental effect on word learning. We sought to extend previous research by examining whether the vocabulary learning context modulates the integration of novel labels into semantic memory. Our methodology builds upon the finding that semantic integration is associated with the emergence of semantic interference between existing lexical entries and newly acquired vocabulary. 60 participants learned novel labels for familiar concepts in two contexts: either comprising concepts from the same or from different semantic categories. The extent of semantic integration of the novel labels was measured by examining picture naming accuracy and latency in a picture-word interference task with distractors that included the novel labels. Results and implications for theoretical models of word acquisition and for second language teaching are discussed.

PS3.4. THE EFFECT OF SPATIAL AND TEMPORAL PREDICTABILITY ON ATTENTIONAL SELECTION IN VISUAL SEARCH. AN ERP STUDY

Szewczyk, M.¹, Augustynowicz, P.¹, Francuz, P.¹, Müller, H.², & Töllner, T.²

1 *The John Paul II Catholic University of Lublin (Poland)*; 2 *Ludwig-Maximilians-University in Munich (Germany)*

Predictive spatiotemporal context enhances attentional orienting. However, it is not fully explained whether (or under which conditions) the effects of temporal and spatial predictability are additive or rather independent. The present study addressed this question and aimed at comparing the effects between localisation and discrimination task in the visual search paradigm. Sixteen people took part in the study. We included ERP measurement to test the facilitation effect of spatiotemporal predictability on different stages of target processing. We observed faster reactions mirrored by shorter PCN peak latency in Space and Space-Time blocks compared to the Random Block and faster sLRP onset in SpaceTime block of the Localisation task, exclusively. Our results suggest that attentional selection is mostly driven by the spatial dimension of predictability regardless of the perceptual difficulty of the task, while motor decisions are facilitated only by combined spatiotemporal and only in case of perceptually easier localisation task.

PS3.5. ADOLESCENT RISK-TAKING IS REWARD DRIVEN RATHER THAN IMPULSIVE

Fryt, J.¹, Smolen, T.², Czernecka, K.¹, Szczygieł, M.¹, & La Torre, A.²

1 *Pedagogical University of Cracow, PL*; 2 *Jagiellonian University, PL*

The presented study was designed to test main prediction of the Dual Systems Model: that reward sensitivity and cognitive control contribute to adolescent risk-taking in additive manner. On both behavioral and self-report level we found that reward sensitivity predicts participants' risk-taking and that such an effect is greater in adolescents than in young adults. However, the effects of cognitive control on risk-taking were different in adolescents than in adults. In adults risk-taking was predicted by weak cognitive control, in adolescents it was predicted by highly efficient control. Results indicate that adolescent risk-taking is reward driven rather than impulsive – possibly most teenagers perceive risk-taking as advantageous strategy and, consequently, not engage control processes to restrain it.

PS3.6. REFACTORING GOOGLE'S N-GRAM FREQUENCY NORMS FOR PSYCHOLINGUISTIC STUDIES

Dufau, S. & Grainger, J.

CNRS & Aix-Marseille University, France

Capitalizing on the Google's Ngram corpus, we examined the possibility to establish frequency norms for sentences in a format suitable for psycholinguistics. Ngram corpus is based on over 8 million digitized books and reflects how often sequences of (N-)words are used in a particular language (8 languages available to date). Even though publicly available, raw data is presented in a form that is difficult to use as is. Frequency is split by year and corpus split into multiple files. In addition, sequences tagged with part-of-speech are mixed with non-tagged ones. Here, we propose a simplified and curated version of the Ngram frequency norms that will help in the material design of psycholinguistic studies. Such curated norms are used in a pilot study to assess whether or not sentence frequency plays a role in sentence recognition.

PS3.7. TOWARDS A COMMON METRIC FOR PERCEPTION AND ACTION: EVIDENCE FROM EYE MOVEMENTS

Pressigout, A. & Doré-Mazars, K.

University of Paris Descartes, France

Numerical, spatial and temporal information are processed by a common magnitude system (ATOM by Walsh, 2003) with similar sensorimotor consequences. Here we focused on saccadic eye movements in order to investigate the impact of magnitudes not only on response times as frequently studied, but also on kinematic parameters of action which have received less attention. In a series of experiments, participants performed a double-task - motor and perceptive- by using different saccade paradigms (i.e. global effect and saccadic adaptation) and natures of the task (i.e. implicit or explicit numerical processing). We showed that number magnitude modulated both the decision and programming stages of a rapid motor outcome such as the oculomotor one. Conversely, a last experiment showed that saccadic adaptation (i.e. movement re-calibration) affected size perception. Overall, our results suggest a common metric for perception and action.

PS3.8. ON THE ROLE OF EXPERTISE IN SPATIAL COGNITION: EVIDENCE FROM PROFESSIONAL HANDBALL-PLAYERS IN A SIMON TASK

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Team ball sports place a high demand on visuospatial skills. Therefore, the present study investigates the role of expertise in a version of the Simon task with multiple spatial reference frames. A group of young professional athletes and age-matched controls performed a Simon task with multiple spatial and nonspatial perceptual reference frames. Photos of a human holding a ball with either hand (object-based, allocentric reference frame) were presented to either side of the screen (viewer-based, egocentric reference frame). The nonspatial perceptual reference frame was introduced by varying the amount of photos shown on the visual display, i.e. either one or a perceptual set of nine identical photos. In contrast to the controls, athletes showed egocentric and allocentric Simon effects independent of the nonspatial perceptual reference frame. Thus, the relative weight allocated to multiple reference frames was modulated by sport expertise.

PS3.9. EXECUTIVE CONTROL TRAINING IN HEALTHY OLDER ADULTS ENHANCES THE BENEFITS OF RETRIEVAL PRACTICE

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In selective retrieval, while repeatedly retrieved items tend to be better recalled (practice effect), those not practiced tend to be hard to retrieve (forgetting effect). At the neural level, brain oscillations show that a decrease in alpha/beta power is associated with efficient encoding, while mechanisms of selective retrieval can be traced by mid-frontal theta brain oscillations. Older adults show a specific impairment in interference detection during retrieval practice, but because the brain remains plastic throughout the lifespan, age-related declines could be compensated through cognitive training. We investigated the transfer of executive control training to the practice and forgetting effects relative to an active control condition (training processing speed). We observed a behavioral enhanced practice effect only in the experimental group, although none of the groups showed forgetting. Neurally, time-frequency analyses suggest that executive control training could benefit older adults' retrieval by a potentiated practice effect, supporting training-induced plasticity during aging.

PS3.10. SADISTIC TENDENCY AND ITS OVER-INTERPRETATION OF FEAR IN THE VOICES OF OTHERS

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This study examines relationships between dark personality traits and processing of vocal emotions. In addition to being presented as naturally fearless individuals, psychopaths have always been the starting point for interpreting emotional recognition deficits. On the other hand, sadistic people exhibit even more extreme behaviors. In a prosody perception task, we evaluated the auditory recognition of emotions by people who have completed questionnaires on the dark tetrad. The results show that correct recognition on vocal emotions is not related with any of the above-mentioned personality traits. However, the analysis of the number of times an emotion was identified whether correctly or not, evidenced a clear relationship between sadism and fear. People with high degrees of sadism hear fearful voices all around. When they hear someone talking, they thus over-interpret vocal emotions as being fear. Interpretations are proposed under the hypothesis of emotion decoding tuned to fear and inhibition of violence.

PS3.11. ERP EFFECTS OF AFFECTIVE COHERENCE OF SENTENCES DESCRIBING SOCIAL INTERACTIONS

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We presented participants in a serial visual presentation task with German sentences describing social interactions varying in affective connotations across three experimental conditions: Affective coherence of the whole sentence could be high, low, or medium according to a mathematical model of Affect Control Theory and based on valence and arousal rating data for single words used in the sentence. As expected, larger N400 amplitudes for less affectively coherent sentences indicate that this type of affective information is used to integrate the meaning of target (final) words into the context of sentences. We also found affective incoherence to trigger fronto-central negativity around 200ms after target presentation - potentially due to conflict detection. Taken together, our data suggest affective meaning of words and sentences to influence basic processes of meaning making during reading.

PS3.12. MORPHOLOGICAL DECOMPOSITION: DEBOOSTING AFFIXES

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Words can be decomposed into smaller meaningful units, known as morphemes (e.g., BUILD-ER). Available data suggest this to happen in rightfully complex words (e.g., dealer), pseudo-complex words (e.g., corn-er), and also when the stimulus is a nonword composed of a real stem and a real affix (e.g., chair-er). On the contrary, the absence of an affix (e.g., cash-ew) seems to result in a lack of decomposition. Are affixes necessary to trigger morphological analysis? We addressed this question in two masked priming experiments comparing different levels of morphological complexity across words and nonwords. Our results suggest that affixes might not be necessary for triggering morphological processing. We also assessed the role of word endings' frequency, and found that this doesn't impact masked morphological priming.

PS3.13. LATE POSITIVE POTENTIAL (LPP) AS A SPECIFIC IDENTIFIER OF DEPRESSION IN ROMANTIC RELATIONSHIPS CONFLICTS

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Depression has been shown to be more strongly influenced by unique environmental factors (~60%) than genetic factors (~40%) when compared to other common disorders (Plomin, DeFries, Knopik, & Neiderhiser, 2013). Past research hasn't focused on whether candidate neurobiological measures differ as a function of any environmental stressor. The goal of the present study is to test the role of relationship functioning on known neural markers of depression and to identify novel markers of depression that are specific to those in a distressed romantic relationship using event-related potentials (ERPs). In our research we evaluate the Late Positive Potential (LPP) in response to pictures of romantic partners' faces in a community sample of adults with varying levels of depression. We found that LPP effect for partner vs stranger exhibit different neural reactivity to pictures of their partners' faces. If successful, this work will yield an objective neural marker that is specific to depression in the context of romantic relationship distress.

PS3.14. NEURAL CORRELATES OF IMPLICIT PROCESSING OF OTHER RACE FACES: A MASKED AND UNMASKED PRIMING STUDY

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The aim of this study was to investigate the neural correlates of implicit processing of "other race" faces by using the masked and unmasked priming paradigm. Event-related potentials (ERPs) were recorded while participants were presented with two types of prime-target pairs: 1. Congruent (prime-target were identical faces); 2. Incongruent (prime-target were different faces). Half prime-target pairs were Asians and half Caucasians. The faces on each pair belonged to the same race and gender. Participants (all Caucasian) were required to indicate whether the target face was female or male. The prime face was presented masked or unmasked. The ERP results indicated an "other race" effect across all components analyzed (P1, N170, N250, P300-like), and a congruency/priming effect on the P300-like, in both the masked and unmasked conditions. The congruency/priming effect was larger in the unmasked condition and for Asian faces, showing a greater difficulty to process faces belonging to another race.

PS3.15. DOUBLING UP: THE INFLUENCE OF FIRST AND SECOND LANGUAGE CUES IN SECOND LANGUAGE DOUBLE CONSONANT SPELLING

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Spellers rely on phonological, orthographic, and morphological cues to consonant doubling, distinguishing between dinner and diner, in English as a first language. This study investigated to what extent these spelling cues are used by second language learners of English. We analysed data from a dictation task that was part of an unsupervised digital learning environment for English as a second language. We assessed the types of spelling errors produced and the spelling difficulty estimates. The error analyses revealed that second language spellers used phonological cues in consonant doubling. Interestingly, the more proficient spellers were, the more they relied on phonological and morphological cues in consonant doubling. Second language spellers did not rely on orthographic cues. Additional analyses showed that spelling difficulty was influenced by the frequency of a word, as well as by its degree of similarity with the native-language equivalent, in terms of

cognate status (non-cognate/cognate) and consonant doubling.

PS3.16. DON'T SWEAT THE SMALL STUFF OR WILL YOU ANYWAY?

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Changes in the activity of the autonomic nervous system can be measured effectively by monitoring electrodermal activity (EDA). Technological advances that showcase wireless, wearable and mobile devices with real-time monitoring capability provide an opportunity to step outside the laboratory and increase the scope of research from single-subject experiments to group settings, measuring unobtrusively from multiple anatomical locations. In this presentation, we demonstrate how effectively new technology captures emotional processes. Using traditional single-placement EDA measurements from the non-dominant hand we report a clear correspondence to subjective ratings of arousal of transient emotions (Kasos et al., manuscript in preparation). Measuring EDA from multiple sites we show that activity patterns can differentiate among emotions, drawing parallels between hemispheric emotion processing and lateral electrodermal activation (Kasos et al., 2018). During active alert hypnosis, we also report links of electrodermal activity to changes in states of self-reported consciousness (Kasos et al., 2018).

PS3.17. PERCEIVING ARTIFICIAL VOICES – AN AUDITORY TURING TEST

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Which paralinguistic features of speech distinguish humans from robots? To answer this question, 91 adults (61 females) listened to randomly presented audio-clips of either synthesized (IBM Watson), or humanoid (robot Sophia) or human voices (5 clips/category) in an on-line study. Voices were rated on intelligibility, human-likeness and naturalness. Speakers were rated on credibility, appeal and likability. Participants' personality traits (Big-Five-Inventory-10) and demographics were obtained. Human voices received reliably higher scores than artificial voices on all dimensions. Human voice ratings were unaffected by personality traits and demographics. Synthesized voice ratings were positively related to participants' openness for new experience and interest in robots. Qualitative content analyses identified intonation, sound, emotion and imaginability as diagnostic features. Humans clearly prefer

human voices but manipulating diagnostic speech features or increasing humans' interest in robots might increase acceptance of synthetic voices and thereby support human-robot interaction.

PS3.18. EARLY NONVERBAL SCREENING FOR MATH LEARNING DIFFICULTIES

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Different screening tools for basic number competence exist, but they rely on verbal instructions and task content, limiting their usefulness in linguistically heterogeneous school populations in which failure to understand the task language might lead to assessment bias. We developed a computerized test battery that uses videos and animations to convey task instructions and problem content and recently published its proof of concept (Greisen et al., 2018). We have now completed a follow-up study aiming at the preliminary psychometric validation of the tasks and its findings will be presented here. Psychometric characteristics of each task and the entire battery will be presented and their predictive performance will be discussed in the light of performance on the Numeracy Screener (Nosworthy et al., 2013) and the Tempo Test Rekenen (De Vos, 1992).

PS3.19. BIMANUAL COORDINATION PERFORMANCE IN PIANISTS AND NON-MUSICIANS: IMAGINED AND EXECUTED SYMMETRIC AND PARALLEL PATTERNS USING DIFFERENT FINGER COMBINATIONS

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UMIT Hall in Tirol

Is better performance in symmetric than in parallel bimanual finger coordination reflected in motor imagery and does this differ between pianists and non-musicians? Pianists and non-musicians performed bimanual coordination patterns by repeatedly pressing keys. Symmetric and parallel coordination were performed with six different finger combinations (consisting of two fingers from each hand). Movements were a) executed with both hands, b) executed with the right hand and imagined with the left hand, and c) imagined with the right and executed with left hand. In both, imagination and execution, symmetric patterns were performed significantly faster than parallel patterns and pianists performed coordination patterns significantly faster than non-musicians. Thus, bimanual coordination constraints and performance ability are represented in motor imagery. Data did not indicate that non-musicians are

less precise than pianists in their imagination. In conclusion, bimanual coordination constraints and performance ability are represented in motor imagery regardless of expertise.

PS3.20. CATEGORIZING DIGITS AND THE MENTAL NUMBER LINE

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Experimental studies investigating the way in which humans process and compare symbolic numerical information regularly used one of two experimental designs. In selection task two numbers are presented, and the task of the participant is to select (for example) the larger one. In classification task a single number is presented, and the participant compares it to a predefined standard. The present study investigated a categorization paradigm in which participants decided if a number presented falls into a numerically defined central category. We show that number categorization yields a highly regular, yet considerably more complex pattern of decision times and error rates as compared to the simple monotone relations obtained in traditional selection and classification tasks. We also show that and how standard diffusion models of number comparison can be adapted so as to account for mean and standard deviations of all RTs and for error rates in considerable quantitative detail.

PS3.21. EFFECT OF BINDING DIFFICULTY ON WORKING MEMORY UPDATING PERFORMANCE: AGE-RELATED DIFFERENCES.

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Working memory updating (WMU) tasks require continuous build bindings between items and their context. Age-related changes in WMU performance may be related to improvements in the ability to build and maintain item-context bindings. We examined possible age-related differences in memory for items and memory for bindings. Four age groups (8-, 11-, 14-, and 21-year-olds) were administered a WMU recognition task (which requires item-context bindings) and a STM recognition task (which does not require binding). The difficulty in binding items to their contexts was manipulated through the mode of presentation of the items. Results showed age-related differences in both tasks, although memory for items reached adult levels earlier than memory for bindings. The effect of binding difficulty on updating performance was similar across the different age groups. These results suggest that certain

binding processes are functional in children and contribute to WMU performance in children and adults to a similar extent.

PS3.22. DOES VISUAL IMAGERY IMPEDE REASONING? EVIDENCE FROM L2 SPEAKERS

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Embodied representations have been suggested to be important for the retrieval of knowledge about concrete objects/events, but much less is known about their role in abstract thought processes. Knauff and Johnson-Laird (2002) suggested that reasoning abilities about transitive relations are reduced in conditions that trigger visual imagery in sighted people. Interestingly, Knauff and May (2006) found no such effect for blind individuals, who by assumption have no visual imagery. As visual imagery is reduced in a second language (L2) (Hayakawa & Keysar, 2018), we predicted that L2 speakers should also show less impedance for reasoning that is accompanied by visual imagery. 24 participants performed visual imagery and reasoning tasks in their first language (L1) and L2. The results suggest a) reduced visual imagery in L2, and b) quicker reasoning involving visual imagery in L2 than L1. This is consistent with the view that visual imagery can impede logical reasoning.

PS3.23. THE COMPETITION BETWEEN NUMERICAL AND CONTINUOUS DIMENSIONS IN A CHANGE DETECTION PARADIGM

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It is generally assumed that humans possess a number sense enabling the manipulation of non-symbolic quantities. Yet evidence shows that non-numerical cues intervene when comparing dot collections. We assessed how number interacts with main continuous dimensions: the area occupied by the dots, the individual dot size, the area of the field surrounding the collections, and the density. In a new paradigm, participants observed a stream of dot collections with deviant stimuli varying either in numerosity, in one continuous dimension, or in both. Participants reacted to changes by pressing buttons according to the type of deviation. Number changes were systematically better detected than other visual changes. When two dimensions varied at the same time, detections of changes elicited more numerosity than visual responses. We discuss the

findings from the perspective of numerosity extraction and decision processes.

PS3.24. PERCEPTUAL LEARNING ACROSS DISTORTED SPEECH INPUT IN DEVELOPMENTAL DYSLEXIA

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Learning to decipher acoustically distorted speech serves as a test case for the study of language-related skill acquisition in individuals with developmental dyslexia (DD). Deciphering this type of input is rarely learned explicitly and does not typically yield conscious insights. Impairments in implicit and procedural skill learning have been proposed as possible causes of DD. Here we tested perceptual learning of distorted speech in young adults with dyslexia and typical readers using two different types of distortion, namely time-compressed speech and spectrally shifted speech. Although both groups showed robust gains after training, we found that the DD group was less able to generalize the training gains to deciphering new tokens. Impaired generalization may have consequences for the ability of individuals with DD to form abstract knowledge. This could explain the difficulties individuals with DD may have in adjusting to and generalizing some of the variability that characterizes phonological categories.

PS3.25. PHONOLOGICAL AWARENESS IN FOREIGN LANGUAGE: CHARACTERISTICS AND RELATIONSHIPS WITH LITERACY SKILLS IN ADULT JAPANESE ENGLISH-LEARNERS

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Being aware of the sound structure of spoken words (phonological awareness, PA) has been shown to play important role in literacy acquisition, not only in children but also in adult foreign-language learners. While PA in foreign language is impacted substantially by their primary language, not much is known about Japanese English-learners, whose primary and foreign languages are quite distant in terms of phonology (e.g., absence/presence of phonemes). Therefore, the present study examined detailed characteristics of English PA and its relation to English literacy skills in 109 adult Japanese by using various PA tasks. As a result, while they generally performed poorly in phoneme tasks (e.g., phoneme segmentation), performance in some tasks were comparable to English-native children (e.g., rhyming discrimination). Moreover, the total PA score correlated significantly with multiple literacy skill

measures, which supported the importance of PA in considering English education in Japan.

PS3.26. PREPARING TO SWITCH LANGUAGES VERSUS PREPARING TO SWITCH TASKS: WHICH WORKS BETTER?

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A substantial literature relates task-set control and language selection in bilinguals. We asked a basic question: is preparation equally effective in the two domains? Bilingual participants switched between naming pictures in one language or another, or (in a separate session) between the tasks of naming and categorization. The trials used for comparing the two kinds of switching were identical in all respects – task (naming), stimuli, responses, etc. – except one: whether the (shape) cue presented before the picture specified the language or the task. Preparation for a task switch was more effective: increasing the cue-stimulus interval from 50ms to 800ms reduced the RT task “switch cost” by ~63%, and the language switch cost only by ~24%. We also investigated the associations between the stimulus and the language (or task) where it was last encountered. Associative history influenced performance overall – but, contrary to some theories, not the task (or language) switch cost.

PS3.27. THE ECOLOGICALLY VALID MEASUREMENT OF PROSPECTIVE MEMORY IMPAIRMENTS IN ADULTS WITH DEVELOPMENTAL DYSLEXIA

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In addition to reading and writing difficulties, individuals with dyslexia experience broader cognitive problems. Prospective memory (PM) relates to remembering to carry out a planned action after a delay. The effects of dyslexia on PM are currently underexplored but evidence indicates that it is impaired, especially when self-initiated or time-based PM (TBPM) is required. Aim: The current research investigated performance on an ecologically valid task in order to obtain a more in-depth understanding of the underlying processes contributing to dyslexia-related deficits and their potential impact on everyday life. Method: 30 adults with dyslexia and 30 adults without dyslexia were assessed using The Dresden breakfast task (Altgassen, Koban, & Kliegel, 2012), a laboratory-based simulated meal preparation task with established ecological validity. This task emulates real-world exemplars of PM in which participants are required to set the table and prepare food items

following specific rules (e.g., putting orange juice on the table before placing two glasses). The participants were asked to perform six subtasks, comprising four TBPM and two event-based subtasks (EBPM), within a seven minute timeframe. Results: The participants with dyslexia performed significantly worse in (i) number of tasks completed, (ii) number of TBPM tasks completed (iii) rule adherence and (iv) following implicit order constraints. However, comparable performances were demonstrated across both groups in: (i) number of EBPM tasks completed, and (ii) number of clock checks. Conclusion: The results demonstrate the real-world impact of dyslexia on PM. They are considered in view of the current understanding of PM deficits in dyslexia.

PS3.28. BOOSTING HUMAN PROCEDURAL CATEGORY LEARNING BY THE DIFFERENTIAL OUTCOMES PROCEDURE
Martínez-Pérez, V., Fuentes, L.J., & Campoy, G.

Two memory systems have been proposed when people perform categorization tasks: a rule-based system relying on explicit reasoning, and a procedure-based system relying on information-integration learning (II) in which performance is maximized if information of two or more dimensions is integrated. Here we studied how participants learned an II task in which the to-be-categorized stimuli differed in two dimensions (A or B), when either differential-based feedback (under differential outcomes procedure, DOP) or non-differential feedback (under non-differential outcomes procedure, NOP) was administered after correct categorization responses. The participants of the DOP group showed better procedural learning in the categorization task compared to the NOP group. The analysis of learning strategies revealed also that more participants developed more optimal strategies with the DOP than with the NOP. These results extend the benefits of the differential outcomes-based feedback to non-declarative memory tasks and help better understand the role of feedback in procedural learning.

PS3.29. CONFLICT MONITORING OR EGO DEPLETION? TRACKING WITHIN-TASK PERFORMANCE IN SINGLE-ITEM AND MULTI-ITEM STROOP TASKS

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The conflict monitoring hypothesis posits a control system responsible for detecting conflicting occasions and adapting to them. In contrast, the strength model of self-control argues that control resources are limited and can be

depleted. However, depletion findings are unstable and have been forcefully challenged. Methodological choices such as dual tasks and neutral conditions may have contributed to the controversy. Adopting an alternative methodology evaluating within-task performance, we compared the classical multi-item version of the Stroop task and its single-item counterpart in adults and children. Our results indicated a performance decline only in the multi-item version of the task, in both incongruent and neutral conditions, consistent with the strength model of self-control. Our results run counter to the conflict monitoring hypothesis and its recent extension, and they also raise substantial concerns regarding the calculation and use of indices of interference based on the commonly used multi-item version of the Stroop task.

PS3.30. NEUROFUNCTIONAL CHARACTERIZATION OF EARLY PREFRONTAL PROCESSES ENDORSING INTERPERSONAL GUILT

Sánchez-García, J., Espuny, J., Hernández-Gutiérrez, D., Casado, P., Muñoz, F., Jiménez-Ortega, L., Fondevila, S., & Martín-Loeches, M.

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Guilt is a social emotion that plays a central role in prosocial behavior. Although relevant, it remains poorly understood. This study characterizes a frontal negative fluctuation of the ERP's in conditions of interpersonal guilt. Paired participants would earn money if both performed correctly a dot estimation task (both right); otherwise, both would lose (self, partner and both wrong conditions). The reported feeling of guilt was noticeable in the SW condition, which yielded a frontal negativity (300-500 ms) after the onset of performance feedback. The amplitude of this fluctuation did not correlate with the amount of guilt reported, whereas both these values did so with measures of empathy. Neither anxiety, nor arousal seemed to relate to this negativity. A LORETA analysis established its generators in the mPFC, a region linked to guilt and empathy in fMRI. The frontal negative fluctuation seems to reflect empathic processes endorsing feelings of interpersonal guilt.

PS3.31. SPECIFIC EFFECTS OF MINDFULNESS STATE ON EXECUTIVE CONTROL, AND THE ROLE OF AFFECTIVE VARIABLES.

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The ability to direct attention to relevant stimuli and inhibit responding to irrelevant stimuli is essential for optimal

functioning. Studies have shown that mindfulness training can facilitate inhibitory control, but the role of affective variables and context has not yet been elucidated.

The current study addressed this ambiguity. Specifically, participants (n=40) filled out questionnaires to assess the level of mindfulness, as well as symptoms of depression, anxiety, and stress. Subsequently, participants performed a standard (neutral) and social condition of a go/no-go task. The social condition consisted of pictures of attractive opposite-sex individuals. For both conditions, pictures were presented to which a response was required, unless the picture was surrounded by a white border. Erroneous data were excluded, and preliminary results (n=20) show a trend towards significance for a detrimental effect of mindfulness on inhibitory control but only for the social context ($p=0.057$). Affective variables did not significantly mediate the effect.

PS3.32. PUT YOURSELF IN MY SHOES ! ADVANTAGE AND LIMIT OF HOW PERESPECTIVE TAKING INFLUENCE JOINT SIMON EFFECT.

Brunel, L., Glaviaux, B., Walter, J. & Buon, M.

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It is now well established that during joint performance agent tends to represent action of their co-actor. This phenomenon is usually investigated using a joint version of the simon task (Sebanz et al., 2003). In this task, we can observe a compatibility effect between participant task set and his position. This effect (i.e., joint simon effect) is interpreted as an index of how agent co-represent the action of his co-actor. In our study, we showed that joint simon effect is moderated by individual perspective taking (see also Ford & Aberdein, 2015) but mediated by social attitude (see also Costantini & Ferri, 2013)

PS3.33. COGNITIVE CONTROL AND CREATIVITY IN YOUNG AND OLDER ADULTS – AN EVENT-RELATED POTENTIAL STUDY OF TASK-SWITCHING

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We investigated how creativity modulates age-related changes in cognitive functioning with a double task-switching paradigm. 30 young (18-30 years) and 30 older (60-75 years) adults were divided into creative and less creative groups according to a visual creativity test. In a cue indexed task participants had to decide whether two figures' inner or outer geometrical forms were identical in their

form/colour or not. This way there were task-repeat, single-switch and double-switch conditions. Less creative older participants had the highest switching cost and task-repeat benefit while more creative older adults showed more similar performance to young adults. More creative young adults had the largest cue-locked N2b and CNV components, while more creative older adults had the largest cue-locked early positivity (P1) among all groups. Increased N2b, as a correlate of top-down processing, and enlarged P1, as an indicator of increased attentional processing, may indicate superior cognitive control in highly creative adults.

PS3.34. PROMOTING WELL-BEING IN PUBLIC SCHOOL TEACHERS THROUGH MINDFULNESS BASED-INTERVENTION: A PRELIMINARY STUDY IN CHILEAN TEACHERS

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Studies suggest that teachers could be more exposed to burnout symptoms depending of multiple sources of stress, such as overcrowded classrooms and limited administrative resources. The main aim of this study is to assess the efficacy of a mindfulness based-intervention in psychological well-being in a group of teachers. The sample comprised 52 teachers of public elementary schools, half of them formed the experimental group, and the other half the control group. The Maslach Burnout Inventory, the Utrecht Work and the Five-Facet Mindfulness Scale were administered in both groups twice, before and after the application of intervention. Results shows no changes in dimensions of engagement, such as professional efficiency, dedication and awareness in the experimental group. By contrast, a deterioration in the same dimensions is observed in the control group. These findings suggest that this approach could be effective and a protector factor in a job stress context.

PS3.35. DECEPTION DETECTION, TRUTH BIAS AND INDIVIDUAL DIFFERENCES AMONG FRENCH GENDARMES AS A FUNCTION OF THE CONTENT OF LIES.

Duran, G., Tapiero, I. & Michael, G.A.

Université Lumière Lyon 2

The present study investigated police officers and laypersons' lie detection performance as a function of the content of lies. It also examined the predictive power of the group (police officer vs layperson), self-monitoring, discourse comprehension, inhibition of interfering information, suppression of intrusive thoughts, mental imagery,

attention and working memory on the ability to discriminate lies from truths and on truth bias. Eighty participants (50% police officers) were required to judge whether individuals were lying or not about opinions, actions or emotions and asked to complete tasks assessing all the above-mentioned processes. Results showed that police officers had more difficulties to detect lies than laypersons and did not present any truth bias. It was also found that selective attention and explicit information negatively predicted the ability to detect deceptive opinions, whilst divided attention and the ability to generate inferences predicted it positively. Implications for lie detection settings are discussed.

PS3.36. IDENTIFICATION OF PERSIAN WH-IN-SITU QUESTIONS: F0 OR DURATION

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Perception of sentence modality contrast (interrogatives vs. declaratives) is guided by several prosodic correlates [e.g., 1,2,3] which do not contribute equally to the identification of this contrast [e.g., 1,3]. [4] demonstrated the influential role of prosody in the recognition of wh-in-situ questions as opposed to declaratives in standard Persian. To investigate the relative contribution of prosodic correlates and their cooperation to sentence type categorization in Persian, this study manipulates F0 and durational cues in the pre-wh part of forty Persian wh-in-situ questions and declaratives. The manipulated stimuli were played to twenty-four Persian native speakers in a forced-choice sentence identification task in which they should decide whether what they heard is going to be a wh-question or a declarative. According to the results, F0 is a primary and duration a secondary contributor to sentence type identification and cooperation of F0 and duration (matching F0 and durational cues) improves sentence type identification.

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PS3.37. THE EFFECT OF METACOGNITIVE STATE ON PROCESS AND REACTION ORGANIZATION IN TASK SWITCHING

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This study examines to what extent task-switching performance is influenced by the meta-control state (persistence versus flexibility, Hommel, 2015) in a classical task-switching (TS) and task-switching-with-preview paradigm (TSWP). We hypothesized that a flexible meta-control state would partially reduce switch cost compared to a persistent state). Secondly, we assumed that individual preferences for parallel versus serial processing in the TSWP were influenced by the meta-control state. Results of two experiments are presented. In the first experiment, 24 participants were presented with either a divergent thinking task or convergent thinking task (to induce flexibility or persistence) before performing a classical task switching paradigm. Initial results indicate that the metacognitive state has no effect on either switching or mixing costs. In the second (still running) experiment, the TSWP is be used to analyze the effect of meta-control state manipulation on to what extend individuals would make use of the preview for parallel processing.

PS3.38. ERP CORRELATES OF EMOTIONAL EXPRESSION ON FACE LEARNING IN MILD COGNITIVE IMPAIRMENT

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Remembering a face requires familiarization. However, there is limited research into this process in people with mild cognitive impairment (MCI). The present study aimed to examine familiarization (learning) of faces with differing emotional expressions in cognitively healthy older adults and adults with MCI. We presented faces displaying various emotional expressions in the learning phase, and then in the testing phase presented the same faces at different viewing angles, in order to ensure that faces were processed in a view-invariant manner. Overall, accuracy was higher for cognitively healthy older adults than people with MCI. Faces that displayed happy expression were better recalled than faces with a neutral expression in older adults contrast to MCI. Older adults showed larger amplitudes and shorter latencies compared to MCI in the N170, N200, and P3b. Emotional faces were found to facilitate the

acquisition of familiarity; this effect was greater for healthy older adults than MCI.

PS3.39. IN SEARCH OF FACTORS INFLUENCING L2 AFTER-EFFECT IN PICTURE NAMING

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Prior usage of a second language (L2) often leads to processing costs on the subsequent production in the native language (L1). However, this L2 after-effect has not been replicated in all studies. In a series of four experiments, we explored how different experimental manipulations modulate the presence and magnitude of the L2 after-effect. We manipulated picture repetition (within vs. between blocks) and participant's expectation of speaking in L2. We have also explored how other factors such as baseline activation of L1 lexical representations, and trial number contribute to the L2 after-effect magnitude. The L2-after effect was present in pictures repeated between blocks, but not within blocks. Mere intention to speak in L2 did not induce the L2 after-effect, which was only present after actually using L2. Moreover, the after-effect diminished with time. The results provide methodological implications for experimental conditions in which the effect can be captured.

PS3.40. PROSPECTIVE MEMORY AND EMOTION: THE EFFECTS OF EXPERIMENTAL MANIPULATIONS OF VALENCE, AROUSAL AND TASK MODALITY

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A recent meta-analysis (Hostler et al., 2018) on the effects of emotion on prospective memory suggests enhanced performance for positively-valenced rather than neutral cues, while negatively-valenced cues did not enhance prospective memory overall. However, the authors suggest that effects of valence are moderated by the arousal level of the cues and that task modality (words vs pictures) may further influence effects. We ran two experiments directly testing these predictions by manipulating cue valence and arousal and examining their effects on prospective memory performance in a task using pictures (experiment 1) or words (experiment 2). Results suggest that prospective memory was reduced for negatively-valenced cues. This impairment was especially pronounced when highly arousing negative pictures served as cues. In contrast to previous findings, positively-valenced cues did not improve prospective memory when controlling for arousal in both experiments. Results are discussed in the context of theories on emotion-cognition interactions and application.

PS3.41. SPEAKER'S FACIAL INFORMATION IMPACTS BRAIN PROCESSING OF CONNECTED SPEECH

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Neurolinguistic research has typically focused on the brain processes that make possible the comprehension of a message. Despite language is an inherent social capacity, the influence of face-to-face contexts on semantic and morphosyntactic processing have not received enough attention. Thus, the mere perception of the speaker's face turns language comprehension into a socially-situated audiovisual process. Further, the speaker's face provides linguistic-related information from visual speech, but also social-related inputs from gaze. Another important type of information that listeners process in face-to-face encounters are the emotional facial expressions. This presentation reunites results of some of our experiments with ERPs. It constitutes the first approach to the electrophysiological study of semantic and morphosyntactic speech processing considering speaker's facial information. The effects of the mere presence of speaker's face, the eyes and mouth dynamics, and the facial emotional expressions will be discussed regarding the linguistic-related components N400, LAN and P600.

PS3.42. ORTHOGRAPHIC NEIGHBOURHOOD AND WORD IMAGEABILITY INTERACT IN FREE RECALL AND RECOGNITION MEMORY TASKS

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Strong effects of word imageability have been reported in memory (e.g., Walker & Hulme, 1999). Moreover, some studies have demonstrated an influence of orthographic neighbourhood density in memory, especially by using a recognition task (e.g., Glanc & Greene, 2007). However, the link between orthographic neighbourhood and word imageability has never been investigated in memory. This study aimed at examining whether these factors interact in episodic memory. Forty-seven young adults performed a free recall task followed by a recognition memory task where word imageability (low, high) and orthographic neighbourhood density (low, high) were manipulated. Results showed an interaction between orthographic neighbourhood density and word imageability in both tasks. In particular, in the recognition memory task, an inhibitory

effect of orthographic neighbours was only demonstrated for low imageable words. These results highlight the important role of lexical-semantic variables in word memory but also the implication of lexical factors in recognition memory.

PS3.43. THINKING ABOUT WASON'S THOG PROBLEM

Martín, M.¹ & Valiña, M.D.²

Reasoning is one of the cognitive processes which psychologists are interested in. Knowing the mechanisms subjects use to elaborate a conclusion or studying which factors modulate inferences, are fundamental axis of empirical investigation on human reasoning. Peter Wason was one of the pioneers of modern Psychology of Reasoning. He designed a series of experimental tasks to study how problems that require planning, hypothesis testing and consequence inference are solved. This work focus on one of these tasks: the THOG problem (Wason, 1977, 1978; Wason & Brooks, 1979). The main objective of this work is to present the fundamental lines of empirical researches and the most relevant theoretical explanations around this task (Martín & Valiña, 2003). Likewise, the repercussion that the research has had on this problem will be analysed for the general study of human reasoning.

PS3.44. EPISODIC INTEGRATION OF CONTEXT SOUNDS DEPENDS ON CHARACTERISTICS OF CONTEXT: EVIDENCE FROM AUDITORY NEGATIVE PRIMING

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In accordance with the encoding specificity hypothesis, prime-to-probe contextual similarity has been shown to increase the auditory negative priming effect (Mayr, Möller, & Buchner, 2018), suggesting that a context sound is integrated with distractor and response into an episode and retrieves this episode when repeated. Here, we analyzed which properties of context lead to an episodic integration of context. Participants responded to targets while ignoring distractors, played against a backdrop of context sounds (300 vs. 700 Hz tones). In contrast to the sudden and simultaneous onset of context and target-distractor pairs in Mayr et al. (2018), a smooth fade-in of context preceded target-distractor onset in the present study. In contrast to our previous findings, context did not modulate negative priming. This suggests that the figure-like character of context and/or its simultaneity with target-distractor pairs are preconditions of context integration with stimuli and responses.

PS3.45. DEVIANCE DISTRACTION: SHIFTS OF ATTENTION TO AND FROM UNEXPECTED SOUNDS OR LOSS OF RESPONSE PREPARATION TO TARGET?

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In the oddball paradigm, in which an irrelevant stimulus (usually a sound) precedes the relevant target, sudden changes (novel or deviant) in the usual stimuli (standard) can capture attention involuntarily, impairing responses to the target (deviance distraction). Time penalties could reflect shifts of attention to and from unexpected stimuli, but could also reflect a loss of response preparation to target that is elicited by the standard sound, when oddball stimuli are presented. In order to test the cognitive locus of deviance distraction, we compared these two plausible explanations in 40 participants using a digit categorization cross-modal oddball task, manipulating the presence of catch trials and the foreperiods (short and long). We found that deviance distraction depended on the SOA as a function of the presence/absence of the catch trials.

PS3.46. PSYCHOLINGUISTIC ESTIMATES AND LEXICAL DECISION TIMES FOR 1000 CROATIAN NOUNS

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Large databases containing lexical and semantic norms have been developed in many languages and have proven to be a useful research tool. The Croatian Psycholinguistic Database contains norms for the categories of concreteness, imageability, subjective frequency and age of acquisition. The aim of this study was to explore the role of these psycholinguistic variables in lexical decision times for 1000 nouns. Lexical decision time data were collected from 40 students who, in two separate sessions, responded to 2000 words and pseudowords divided in ten blocks of 200 trials. A multiple regression analysis was conducted to examine the contribution of concreteness, imageability, subjective frequency and age of acquisition, along with word frequency and word length, in explaining lexical decision reaction times. The results demonstrated that these variables accounted for a significant portion of variance in the RTs and are consistent with results of similar studies in other languages.

PS3.47. ADVANCE INFORMATION ABOUT A FORTHCOMING TASK SWITCH REDUCES N - 2 REPETITION COSTS

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N-2 repetition costs are one of the most straightforward indications for the involvement of inhibitory processes in task switching. In the present study, we used a modified task switching paradigm with three tasks and two kinds of cues. One type of cue consisted of a standard task cue indicating which task to perform in the upcoming trial, while in half of the blocks, this cue was preceded by another cue (pre-cue) which reduced the set of candidate tasks from three to two. While significant n - 2 repetition costs were visible without such a pre-cue, they were reduced to zero if the set of candidate tasks was reduced to two. This result is interpreted in terms of an establishment of antagonistic constraints among the two remaining tasks, thereby facilitating task set activation and reducing the need for inhibition.

PS3.48. AFFECTIVE MODULATION OF ACQUISITION VS. EXPRESSION OF CONTEXT-BASED MEMORIES: DISSOCIATIVE ROLE OF POSITIVE AND NEGATIVE EMOTIONS

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Emotions can either facilitate or hamper extraction of statistical regularities from perceptual input when presented during acquisition of context memories. We investigated further whether context memory of spatial target-distractor relations in visual search is influenced by task-irrelevant affective stimuli presented later during the task, when context-based memories are already formed. In phase 1 of the study, repeated (fixed target-distractor arrangement) and non-repeated (random arrangement) search arrays were presented against a black background. In phase 2 of the study, previously learned repeated as well as novel non-repeated search arrays were paired with positive, negative, or neutral background images (randomly selected). We found that the 'contextual cueing' effect (reaction times to non-repeated minus repeated arrays) was comparable for negative, positive and neutral backgrounds, when these were presented together with already learned spatial contexts. Together, these findings suggest that emotions have valence-specific effects on encoding but not expression of spatial target-distractor relations.

PS3.49. ABSENCE OF EMBODIMENT EFFECTS ON MEMORY RECONSOLIDATION

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The present study aimed to investigate the impact of motor activity on the process of reconsolidation of information related to movement. After studying words related to the motor actions of pressing (e.g., piano) and twisting (e.g., pedal), or neutral words (e.g., house), participants returned next day for performing a simple task involving the motor components of one type of the studied motor words during a reconsolidation session. After a retention interval of 24 hours, an unexpected memory test for the words was administered. The results showed memory differences for the type of word, with "twist" words being better remembered than "press" words. However, memory for the words was not affected by the post-learning motor activity performed during the reconsolidation session. The results will be discussed in relation to current accounts of reconsolidation and embodiment theories.

PS3.50. EFFECTS OF VISUOMOTOR ADAPTATION ON THE RECALIBRATION OF MAXIMUM REACHING ESTIMATIONS DURING JUMP

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Performing goal-directed movements requires constant calibration of space perception and reaching behaviors by using sensorimotor feedback (Bourgeois & Coello, 2012). This visuomotor adaptation and its consequences on perception are usually studied by introducing spatiotemporal distortions during the performed action (for a review, see van Andel, Cole & Pepping, 2017). In this current study, immersive virtual reality (IVR) is used in order to¹ manipulate visual feedbacks during movements and² measure perceived capacity inside the virtual environment (VE). Our goal is to demonstrate that it is possible to alter the calibration of perceptual judgments by modifying the height of jumps. We compared three groups of participants¹ normal jump height² increased jump height³ decreased jump height. Our results indicated that altering the visual feedback of the participants in the IRV can induce a perceptual judgments bias on their ability to act but also modify their actions.

PS3.51. TMS OVER THE SUPERIOR TEMPORAL SULCUS AFFECTS EXPRESSIVITY EVALUATION OF PORTRAITS

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When viewing a portrait, we are often captured by its expressivity, even if the emotion depicted is not immediately identifiable. If the neural mechanisms underlying emotion processing of real faces have been largely clarified, we still know little about the neural basis of evaluation of (emotional) expressivity in portraits. This study aimed at assessing, whether the superior temporal sulcus (STS) and the somatosensory cortex (SC), that are important in discriminating emotional faces, are also involved in the evaluation of expressivity of portraits. We found that interfering via TMS with activity in STS reduced the extent to which portraits were perceived as expressive, without affecting their liking. In turn, interfering with activity of the SC had no impact on evaluating either expressivity or liking. Our findings suggest that evaluation of emotional cues in artworks recruit (at least partially) the same neural mechanisms involved in processing genuine biological others.

PS3.52. COMPARING BEHAVIOURAL AND NEURAL CORRELATES OF ITEM- AND FEATURE-BASED PRIORITISATION IN VISUAL WORKING MEMORY

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Attention can be directed to internal representations in memory; to prioritise particular items, or particular feature-dimensions that are shared between items. In contrast to item-prioritisation in visual working memory, little remains known about the behavioural benefits and neural basis of feature-dimensions prioritisation. Moreover, no study has directly compared item- and feature-based prioritisation at the behavioural and neural level. Using electroencephalography, we tested 30 participants on a WM task where participants remembered two items with different orientations and colours. Following retro-cues, participants prioritised either an item or a feature-dimension across both items. Behavioural results show that both cue-types reduced recall error and reaction times, and were highly correlated across participants. The EEG data further showed similar attenuation of 8-12 Hz alpha-band oscillations in posterior electrodes. Thus, like item-prioritisation, feature-dimensions can also be prioritised in visual working memory and such internal feature-prioritisation too is associated with the attenuation of posterior alpha-band oscillations.

PS3.53. ATTENTIONAL BLINK AND PUTATIVE NON-INVASIVE DOPAMINE MARKERS: TWO EXPERIMENTS TO CONSOLIDATE POSSIBLE ASSOCIATIONS

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Adaptive behavioral control involves a balance between top-down persistence and flexible updating of goals under changing demands. The Attentional Blink (AB) task has been argued to tap into the interaction between cognitive persistence and flexibility, reflecting over-persistence—the too-exclusive allocation of attentional resources to the processing of the first of two consecutive targets. Notably, previous studies are inconclusive about the association between the AB and non-invasive proxies of dopamine including the spontaneous Eye Blink Rate (sEBR). We aimed to substantiate and extend previous attempts to predict individual sizes of the AB in two separate experiments with moderately large sample sizes (N=71 & N=65) by means of non-invasive behavioral and physiological proxies of dopamine, such as sEBR and mood measures, and color discrimination, which has been argued to tap into the frontal dopamine levels. Our findings did not confirm the prediction that AB size covaries with sEBR, mood, or color discrimination.

PS3.54. INDIVIDUAL DIFFERENCES IN SECOND LANGUAGE LEARNING IN INTENTIONAL AND INCIDENTAL CONTEXTS

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We examined individual differences in incidental and intentional second language rule-learning tasks. Spanish monolinguals were exposed to an English-grammar rule by presenting grammatical sentences and asking questions about them. One group was informed that the sentences followed a rule (intentional), while the other group did not receive these instructions. Rule learning was later assessed by asking participants whether old/new sentences were grammatical. To capture individual differences, participants performed the AX-CPT, and Global-Local tasks. Intentional learning produced better learning of studied and new grammatical sentences (rule-generalization). However, correlational analyses indicated that in the intentional condition, people with larger proactive control (BSI in AX-CPT) were better at generalising the rule than participants with lower BSI. In contrast, in the incidental condition people with more global facilitation were better at generalising than people more focally oriented. This suggests that the cognitive profile of learners modulates the success of grammatical learning in intentional/incidental contexts.

PS3.55. PROACTIVE INTERFERENCE IN VISUAL SHORT-TERM MEMORY WITHIN VERSUS ACROSS HEMIFIELDS

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Visual short-term Memory (VSTM) possesses some degree of hemispheric organisation, in that memory traces are stronger in the hemisphere contralateral to the hemifield in which the information has been displayed. Furthermore, research has found that VSTM is subject to proactive interference (PI), which occurs when processing on one trial negatively affects performance on a subsequent trial. Hence, a primary question of interest is whether PI is hemifield-dependent. Using a modified recent probes paradigm, the present study shows that memory for the preceding trial interferes more if it matches the feature value and the hemifield of a test item than if it does not. In other words, the effect of PI on VSTM is significantly larger when the probe and the interfering stimulus are both distributed to the same single hemifield as opposed to different hemifields. This suggests that traces of previously memorised information persist in VSTM and remain contralaterally organised.

PS3.56. READING IN PARAFOVEA: THE EFFECT OF LENGTH, FREQUENCY AND SEMANTIC FACTORS.

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The literature about parafoveal processing is currently not conclusive in terms of the factors influencing reading. While some authors have highlighted the role of visual and orthographic factors, others have shown the importance of the semantic component.

We used a rapid parallel visual presentation to investigate the concomitant impact of visual, orthographic and semantic factors: two words were simultaneously presented for 130 ms. Length, frequency and semantic relatedness were orthogonally manipulated.

Results indicate that accuracy on the parafoveal word is influenced by the length and frequency of word1 and by the semantic relatedness between the two. The statistically significant interaction semantic relatedness by w1-frequency indicated that word2 reading is influenced by the word1-frequency, but only when they are semantically related. The results suggest that reading in parafovea is influenced by visual, orthographic and semantic factors and by

the interactions among them, with important Implications for models of reading aloud.

PS3.57. WORKING MEMORY (BUT NOT NUMBER SENSE) MEDIATES MATH ANXIETY AND MATH ACHIEVEMENT RELATIONSHIP IN YOUNG CHILDREN

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The cognitive mechanism by which math anxiety impairs mathematical achievement is unclear. Among the explanations, one can find the hypothesis that¹ a deficient number sense underlies math anxiety which in turn decreases math achievement, and² math anxiety burdens working memory resources which impair math performance. While many studies among adults confirm these hypotheses, the existence of a relationship between math anxiety, number sense, working memory and math achievement among young children has not been intensively explored so far. The relationship between these variables among young children was tested in the study. The results indicate that working memory mediates the relationship between math anxiety and math performance, but number sense turns out to be not related to math anxiety. The obtained results confirm the importance of working memory and undermine the role of number sense as cognitive elements explaining the mechanism of action of math anxiety on math performance.

PS3.58. RESPONSE CONFLICT DURING PRICE EVALUATIONS: CAN RESPONSE LATENCIES AND RESPONSE FORCE INDEX CONSUMERS' WILLINGNESS-TO-PAY?

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Neuroeconomics contributed to our understanding of how implicit processes influence purchase decisions. Here, we present a new technique to measure what consumers are willing to pay for a product. Reliably indexing consumers' willingness-to-pay has proven to be difficult. Therefore, we measured response force in addition to traditional response latencies during a simple binary choice task. Participants were required to evaluate a series of prices as cheap or expensive. Crucially, the absolute magnitude of these prices was manipulated, creating both ambiguous and unambiguous prices. We expected that more ambiguous prices (i.e., prices closer to the anticipated price) should more strongly favor both evaluations of cheap and expensive, resulting in response conflict. We postulated that more and slower response latencies, less forceful and more partial responses should be observed for these prices.

Overall results showed that more ambiguous prices result in slower response but not in less forceful and more partial responses.

PS3.59. GENERALIZATION, TRANSFER AND EXTINCTION OF CONDITIONED ATTITUDES

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The aim of the study was to investigate the mechanisms of attitude generalization and extinction in the evaluative conditioning (EC) procedure. EC refers to the change in the evaluation of a conditioned stimulus as a result of multiple pairing with affective unconditioned stimulus (US). Firstly, participants were presented with two pairs of neutral stimuli (CS1-CS2). Afterwards, one stimulus from each pair was conditioned by affective stimuli. In the extinction phase participants were presented with either conditioned (CS1) or pre-conditioned (CS2) stimuli. The explicit evaluations were assessed both after conditioning and extinction. There was a significant extinction effect of conditioned evaluations which depended on the type of the extinction procedure. The effect of transfer/generalization of conditioned evaluations on previously associated stimuli (CS2) was not found. The results are in line with dual process theory which predicts the interaction of associative and propositional processes.

PS3.60. VALUE-DRIVEN ATTENTIONAL CAPTURE UNDER LOAD: AN ERP STUDY

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Reward-associated stimuli have been proposed to automatically attract attention, a phenomenon known as “value-driven attentional capture” (VDAC). However, only a few studies have investigated whether attentional control could counteract VDAC. We examined VDAC under a situation known to reduce or eliminate distraction by salient and emotionally negative irrelevant stimuli: high perceptual load. We measured the electrophysiological signatures of attentional selection and suppression (the N2pc and Pd components) for low- and high-reward distractors

under low- and high-load conditions. Under low-load, distraction was greater for high- rather than low-reward distractors and high-reward distractors only evoked an N2pc. Under high-load, distraction was abolished for low-reward distractors, but merely reduced for high-reward distractors, and low- but not high-reward distractors evoked a Pd component. Those results help understanding how perceptual load interacts with reward to determine whether or not a reward-associated irrelevant stimulus will cause distraction.

PS3.61. INTERRUPTIONS IMPROVE PERFORMANCE IN MULTIPLE-TARGET VISUAL SEARCH: THE CASE OF DETECTION OF MULTIPLE WEAPONS IN LUGGAGE X-RAY IMAGES

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Multiple-target visual search is known to create the “Subsequent Search Misses” (SSM), which is a lower probability to detect a target after having already detected one. We wanted to know if the SSM would be influenced by interruptions. We thus carried out 2 experiments in which participants had to detect weapons in luggage X-ray images. In experiment 1, there were 0, 1 or 2 weapons per luggage and interruptions (resolving 8 simple additions) occurred before any target was detected. In experiment 2, there were 1 or 2 weapons per luggage and interruptions occurred after one weapon had been detected. Results showed that accuracy decreased with increasing number of weapons, but less if the search were interrupted. We also found the expected SSM, but were more pronounced in experiment 2, suggesting that the moment of the interruption influences the detectability of the second weapon.

PS3.62. VALIDATING MIND-WANDERING SELF-REPORTS WITH OBJECTIVE PERFORMANCE MEASURES: SENIORS' REPORTS ARE COMPARABLE TO YOUNGER ADULTS'

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Notwithstanding the decline of executive control with aging, seniors report less mind-wandering (MW) than younger adults. This finding challenges the theoretical view of MW as a failure of executive control. As an alternative explanation, reduced introspection ability in older age might let attentional fluctuations more often go unnoticed. We assessed the validity of the self-reported degree of attention towards the task vs. MW in healthy seniors compared to younger adults. In three tasks, namely¹ reading with embedded gibberish detection,² a whole-report visual working memory task, and³ a go/no-go task, self-reported

degree of attention towards the task vs. MW predicted objective measures of inattentiveness for both younger adults and seniors. Replicating the literature, seniors reported higher overall attention than younger adults. The results corroborate the validity of seniors' attention self-reports and the use of self-reports in MW research across adult age.

PS3.63. SELF ASSOCIATED DISTRACTOR DOES NOT INFLUENCE SEARCH

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Recent empirical work on Self shows perceptual benefit for newly learned self associations [self referential processing (SRP) effect], proposing that associating self to a stimulus increases its perceptual saliency. Thus, it is plausible that associating self with a distractor might show greater distraction effect compared to non-self associated distractor. In two experiments, we manipulated distractor's saliency and examined its effect on target search. We hypothesized that if self mimics perceptual saliency effect then target search will be slower for self associated distractor as compared to non-self associated distractor condition. Participants first learned to associate shape (e.g. triangle and pentagon) and label (self and friend in Exp1 and self and mother in Exp2) and then performed an additional singleton search task. The overall result showed a similar RT for both of the distractor conditions, suggesting that distractor's self-relevance doesn't affect target search performance, proposing that the attentional mechanism involved in SRP is not pre-attentive in nature. Our results question the general narrative of perceptual saliency of the self.

PS3.64. EFFECTS OF COGNITIVE REAPPRAISAL ABILITY AND FREQUENCY ON MENTAL HEALTH

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It is known that cognitive reappraisal, which is an effective emotion regulation strategy, facilitates mental health. However, previous studies have not made a distinction between cognitive reappraisal ability and frequency. The present study examined whether cognitive reappraisal ability or frequency is more effective in facilitating mental health. Twenty-four university students completed a cognitive reappraisal ability task. In addition, we measured cognitive reappraisal frequency with the Cognitive Emotion Regulation Questionnaire, and mental health with the Subjective Happiness Scale. We conducted a multiple regression analysis to predict mental health based on cognitive

reappraisal ability, frequency, and their interaction. Although cognitive reappraisal ability has little effect on mental health ($\beta = .06$), cognitive reappraisal frequency has a positive effect on mental health ($\beta = .41$). Based on these results, we discuss the differences between cognitive reappraisal ability and frequency.

PS3.65. ATTENTIONAL SYSTEMS IN ITALIANS AND CHILEAN CHILDREN WITH ADHD: EFFECTS OF TWO DIFFERENT EDUCATION SYSTEMS

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The Attention Deficit Hyperactivity Disorder (ADHD) is one of the most common psychiatric disorders in childhood. This study aims to assess whether two different school integration strategies, Italian special education teacher and Chilean School Integration Program (PIE), can differently affect the efficiency and interactions of attentional systems in children with and without ADHD. Thirty-four Chilean children/adolescents (17 ADHD, 17 Control) and 34 Italian children/adolescents (17 ADHD, 17 Control) aged between 6 and 15 completed the Attentional Network Test for Interaction and Vigilance, which allows evaluating the three attentional components (orienting, alerting, executive) simultaneously. The results showed that ADHD children were slower and less accurate respect to typically developing children. Furthermore, ADHD groups, specifically the Chilean children showed a higher impairment in executive functioning. These finding could be explained by the different education systems that can influence differently executive performance.

PS3.66. PROSPECTIVE MEMORY IN MONOLINGUALS AND BILINGUALS

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Prospective memory (PM), the ability to remember intentions in the future, requires to maintain intentions, and actively monitor the context for cues to execute the intention. Recent results suggest that people differ in PM strategies depending on the nature of the task. We explored whether bilinguals and monolinguals differ in these strategies by manipulating the nature of the PM cue (focal versus. non-focal) and recording EEG during the tasks. Although behavioral results showed similar performance for both groups, EEG data indicated that they differed in the

strategy used. Analyses of the N300 and P300 components indicated that monolinguals and bilinguals used different cue monitoring strategies with monolinguals showing and interaction between focality and type of trial that it was not present for bilinguals. These results might be on-line with previous experiments suggesting that bilinguals differ from monolinguals in the way they adjust proactive and reactive strategies in attentional tasks.

PS3.67. WORKING MEMORY COMPONENTS UNDERPINNING THE MAGNITUDE REPRESENTATIONS OF COMMON FRACTIONS IN JAPANESE UNIVERSITY STUDENTS

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This study investigated whether the phonological loop or visuo-spatial sketchpad components of working memory underpin the magnitude representations of common fractions: 1/4, 1/3, 1/2, 2/3, and 3/4. We tested the impacts of phonological and visuo-spatial suppression on the comparison of a common and uncommon fraction (common fraction pair) and a pair of uncommon fractions (uncommon fraction pair). Reaction time analyses revealed that¹ the magnitude distance effect was attenuated in common fraction pairs including 1/2 or 1/4,² both suppressions had negative impacts on all pairs, and³ performance on pairs including 1/2 or 5/9 (fractions around half) was more resistant to visuo-spatial than phonological suppression. We concluded that¹ 1/2 and 1/4 have more sophisticated magnitude representations than uncommon fractions,² all fractions depend on both working memory components to represent magnitude, and³ representing a magnitude of half is less demanding on visuo-spatial processing.

PS3.68. THE MENTAL REPRESENTATION OF NUMBERS AMONG NATIVE SPEAKERS OF RIGHT-TO-LEFT WRITTEN LANGUAGES

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The SNARC effect suggests that people represent numerical magnitudes along a left-to-right mental number line. This is especially pronounced in cultures where people read and write words from left to right. It is absent or reversed in cultures with right to left word reading direction. The present study is the first to investigate the direction of the SNARC effect among two groups of Arabs who read and write letters from right-to-left, but use two numeration systems differing in their writing direction. The Arabs living in Israel use the "Arabic" numeration system^{1,2,3} written

from left-to-right, while the Arabs living in the Palestinian National Authority use the Hindu-Arabic system (٣,٢,١) written from right-to-left throughout high school and formally start using the Arabic system only in college. Preliminary results hint that the direction of mental number line is affected by the direction of numbers writing in addition to that of word writing.

PS3.69. SPONTANEOUS RS-FMRI ACTIVITY WITHIN THE HIPPOCAMPUS RESPECTS THE CLASSIC HIPPOCAMPAL SUBFIELDS

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Resting state (RS) networks rely on different brain areas and the hippocampus (HP) is often involved. HP is also related to memory formation and has also been implicated in neurodegenerative diseases such as Alzheimer's Disease (Van Strien et al., 2009). A classic characterization of the HP includes subfields among which the Subiculum, Molecular Layer, CA1, CA2/3, CA4 and Dentate Gyrus (Morra et al., 2008). However, the functional characteristics of these substructures remain poorly understood (Yassa & Stark, 2011). We question if these subfields play a different role and contribute to the RS networks in several ways. If the hippocampal substructures serve a functional role, one would expect RS networks detected within the HP and differentiate between the hippocampal substructures. Thus, we performed a RS study with high-resolution fMRI to observe the activity in the subfields of the HP. Our results suggest different RS networks involved within the hippocampal substructures.

PS3.70. THE EFFECT OF DIVIDED ATTENTION ON FALSE MEMORY: EVIDENCE FROM A VIRTUAL REALITY TASK

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False memory (FM) consists in remembering events that never happened or remembering them quite differently from the way they happened. The issue of how divided attention influences FM remains unresolved. Here we investigate the effect of divided attention on the production of FM during encoding using a variant of the Deese/Roediger MacDermott paradigm built using virtual reality. During encoding phase young and elderly subjects are asked to walk in a virtual town and to memorize as much elements

as possible with spatio-temporal information and perceptive details. Main findings show that in the control condition older adults compared to younger exhibit an increase of FM including both erroneous factual and spatiotemporal information. On the other hand, the divided attention at encoding allowed to a significant increase of FM in both groups together with a decrease of spatio-temporal information related to FM in older subjects.

PS3.71. ICONIC GESTURES PRIME VISUALLY PRESENTED WORDS WITH A SHORT SOA

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Previous studies using cross-modal semantic priming with auditory word presentation, have found that iconic gestures (IGs) prime target words that are related with the gestures (e.g., Sánchez-Borges & Álvarez, in preparation). For instance, the verb "push" preceded by a person moving their hands forward. However, in today's world, gestures do not only come with the language we hear. Gestures also appear in synchrony with the written language, for example, in videos or in films with subtitles. In the present study we used a priming paradigm with a lexical decision task, where visually presented words (verbs and nouns,) were closely preceded by IGs related or not to the words. Words in the related condition were answered faster than words in the unrelated condition, independently of the grammatical category. The IG priming effect appeared also in the visual modality. The notion of interaction between the mental representations of gestures and words is supported and discussed.

PS3.72. ACTION-EFFECT-RELATED MOTOR ADAPTATION IN A DYNAMIC SETTING

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Sensory feedback influences how actions are performed. When action success is signaled by distinctive effects (e.g., beep, light flash), participants rely on these stimuli to optimize their movements. When distinctive effects are absent, participants exert more effort (reflected, for example, in higher action forces) to increase the probability of action success. The current experiment explored the manifestation of these strategies in a dynamic setup in which action-effect relationships changed from time to time. Participants pinched a force sensitive resistor repeatedly.

Sequences of actions eliciting tones were interleaved with sequences of actions without distinctive sensory effects. Sequence length was manipulated between conditions. Longer sequences resulted in more pronounced force optimization. During the sequences, a gradual change in applied force was observed, indicating a repeated learning and unlearning of effect utilization and a stepwise adjustment of action priorities (i.e., effort minimization or success maximization).

PS3.73. PHYSICAL INTERACTION WITH INSIGHT PROBLEMS MINIMALLY AFFECTS THE PROBLEM SOLVING PROCESS

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Insight problems are believed to tap into sudden, creative thinking. In contrast, recent findings suggest that they depend on the same cognitive mechanisms that underpin analytical thinking, including attention control and working memory. However, existing studies may have low ecological validity, because insight problems were usually presented in the paper/computer formats which allowed no physical interaction with the problem elements. This study (N = 265) administered 9 established insight problems either in the static or interactive variants. It also probed working memory capacity. Virtually no difference in performance was observed between the static and interactive variants of insight problems with regard to solution rates, subjective experience accompanying the solutions, as well as correlations with working memory capacity. It seems that the role played by externalized/embodied/situated factors in insight problem solving may be negligible, and the crucial parts of this process seem to occur in the mind of a solver.

PS3.74. CONSCIOUS ACCESSIBILITY AS A FUNCTION OF DISTANCE FROM THE FOCUSED ATTENTION

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Does conscious accessibility follow objective task performance outside of focused attention as it does inside it? Our previous change detection experiment suggests it does, at least for the items directly neighbouring the focused object. However conscious accessibility of these items is even higher than we would expect. Current experiments were designed to minimise response bias, which might have affected previous results, by using the continuous colour estimation task. To assess conscious accessibility, we used a subjective visibility scale, as in the original experiment.

Experiment 1 was designed to assess whether task order (estimation and visibility rating) affects response. In Experiment 2 we plan to use the probability cuing method, as in the change detection task. This method encourages participants to not disregard objects outside of focused attention. The goal of this experiment is to replicate the effects from our change detection task and generalise it to a different task.

PS3.75. CHUNKING DURING DEMANDING COGNITIVE TASKS

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Chunking is a process by which patterns of novel elements can be merged into a single long-term memory representation, capable of supporting efficient processing in working memory tasks. Previous research revealed that non-words – strings of arbitrarily chosen letters – can be chunked not only when actively trying to encode these non-words but also while performing a well-trained task of typing them. Here we assessed whether a similar process of chunking occurs within a complex novel task requiring serial analysis of letters within a non-word, with each letter mapping onto a different decision concerning perceptual stimuli. We used a concurrent load technique by which the effects of chunking should be revealed in superior capacity for performing a secondary memory task. We found no evidence of chunking with six consecutive repetitions of each non-word, suggesting that the process of chunking might be disrupted during demanding cognitive tasks.

PS3.76. IS BILINGUALISM ASSOCIATED WITH BETTER WORKING/SHORT-TERM MEMORY CAPACITY? A META-ANALYSIS.

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Due to their experience of managing two languages, bilinguals are supposed to outperform monolinguals on cognitive control functions. Given that there is a strong link between these functions and working memory (WM) capacity, it is reasonable to expect to find a bilingual advantage in WM too. However, the studies investigating WM capacity in bilinguals provide inconsistent findings regarding the existence of such a bilingual advantage (Morales, Calvo, & Bialystok, 2013; Ratiu & Azuma, 2015). We therefore conducted a meta-analysis on the effects of bilingualism on working/short-term memory capacity. Data from 148 studies were extracted. At the moment, statistical analyses are ongoing. Based on previous findings, we will examine age,

characteristics of the WM tasks –i.e. verbal vs. nonverbal material and complexity of the task, age of first L2 exposure, and L2 proficiency as potential moderating variables.

PS3.77. FORGETTING WHAT WAS WHERE: INSIGHTS FROM UNILATERAL SPATIAL NEGLECT PATIENTS

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How do we remember where was an object that we had just seen? Is the identity of an object maintained together with its location? We addressed these questions by studying patients with Unilateral Spatial Neglect that have a deficit in spatial memory and a deficit of attention for one side of space. This enabled us to compare how object-location binding is forgotten when it is displayed on the neglected and un-neglected fields, within the same subjects. Fourteen patients were tested in two different delayed-estimation tasks, with long and short delays and an analogue response scale. We found that time related forgetting of object location information was not accompanied by forgetting of its identity. Moreover, the increase in errors following longer delays was explained by swap errors. We conclude that identity and location of objects are not tightly bound in working memory and that this binding weakens when extending the delays.

PS3.78. BASELINE-DEPENDENT EFFECT OF DOPAMINE ON WORKING MEMORY GATING BUT NOT UPDATING

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Adaptive goal-directed behavior requires a dynamic balance between maintenance and updating within working memory (WM). This balance is controlled by a gating mechanism, which is implemented by the striatal dopaminergic system. Although dopamine agonists can modulate WM performance, it is often not clear whether this is driven by a change in updating or gating efficiency. To address this question, we administered dopamine's precursor L-tyrosine to healthy young adults in a placebo-controlled, within-subjects study. WM was assessed with the novel reference-back paradigm, which can disentangle WM updating, gate opening, and gate closing. L-tyrosine had a selective and baseline-dependent effect on gate opening but not closing or WM updating: low-performing subjects improved whereas high-performing subjects deteriorated following L-tyrosine administration. Our results are the first

demonstration of non-linear effects of L-tyrosine on cognition and they highlight the need to distinguish between updating and gating efficiency in studies of WM.

PS3.79. INDIVIDUAL DIFFERENCES IN REPORTING INSIGHT PHENOMENOLOGY: EXPLORING THROUGH AN ALTERNATIVE (USES) TASK

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Investigating individual differences in tendency to report insight is constrained by the “problem of problems”; that is, problem-solving skills (e.g., working memory) are required for problem solving, including insight problem solving. We explore the use of a divergent thinking task, in which subjective accuracy is high, as a method of exploring individual differences associated with aha experiences. Participants (N = 225) completed an adaptation of the alternative uses task, reporting aha experiences in a trial-wise manner. Participants were then presented with various solutions to the previous task. Participants also completed a measure of schizotypy (i.e., the O-LIFE) to assess whether positive schizotypy (associated with the tendency to perceive meaning in noise) predicted tendency to report aha experiences. We found generating a use was significantly more likely to result in a reported aha experience than being presented with a use, and that positive schizotypy was a positive predictor of aha experiences.

PS3.80. OPEN YOUR MIND’S EYE: SENSORIMOTOR SIMULATION IN EPISODIC EVENT CONSTRUCTION

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Past events are not frozen into memory. Instead, they can be dynamically recombined to reconstruct them or, even, to imagine future events. Yet, very little is known about how event (re)construction is accomplished. From an embodied cognition perspective, we assessed whether event (re)construction occurs through the simulation/reactivation of sensorimotor properties of our past experiences. Young adults watched videos and received a specificity induction (an interview boosting the production of event-specific details) or solved math problems. Then, they described their memories of the videos while simultaneously viewing an interfering stimulus (dynamic visual noise; DVN) or a control stimulus. As expected, viewing a DVN during the description task has decreased the number of video-specific details reported, but only after the specificity induction. These findings provide evidence that the

specificity induction targets and facilitates the sensorimotor simulation mechanism, confirming the crucial involvement of such a mechanism in the constructive functioning of memory.

PS3.81. USING PUPILLOMETRY TO REVEAL PROCESSING ADVANTAGES IN SYSTEMIZING AND EMPATHIZING

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Empathizing-Systemizing (E-S) theory asserts that people differing in E and S should excel at different types of cognitive processing. However, the behavioral evidence is mixed. We used pupillometry to investigate the effort evoked by tasks requiring systemizing (e.g., mental rotation) or empathizing (e.g., predicting emotions). The behavioral results showed that high systemizers responded quickly and with few errors to S tasks, and more slowly to E tasks. However, pupil dilations revealed that high systemizers put more effort into S tasks than to E tasks. Empathizing was unrelated to task performance but related to overall higher effort. These results suggest that high systemizers are not more efficient at processing systemizing type tasks than low systemizers, and rather that their high performance is due to more effort. Moreover, these results indicate that pupillometry can fruitfully be applied to research topics on social cognition, and reveal underlying cognitive processes unseen by behavioral methods.

PS3.82. THE SIGN LANGUAGE IN A TWO-DIGIT NUMBERS COMPARISON TASK

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Even when language and numerical cognition are considered as separated domains, they are intimately connected. The development of numerical skills requires the use of language. And a large body of research has shown how the peculiarities of languages influence even the basic numerical processing. Sign languages are based primarily on a hand-effector system for communication. The use of space and fingers makes sign languages a good candidate to explore the interaction between language and numerical cognition. In this study, deaf individuals performed a two-digit numbers comparison task by indicating the larger of two numbers in Italian sign language. Reaction times and accuracy were examined in order to check some well-known effects in this task (i.e., unit-decade compatibility effect and distance effect). In addition, several measures of the hand movements were evaluated to explore the

influence of the numerical magnitude during number sign production.

PS3.83. THE EFFECT OF FACIAL COLORS ON EMOTIONAL STROOP TASKS WITH FIGURATIVE AND LITERAL EXPRESSIONS

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We investigated effects of facial colors on the emotional Stroop task with different types of linguistic expressions. Linguistic expressions were attached on the face and participants were asked to ignore the face and judge whether the language expression meant angry or sad. By computing a linear mixed model that includes congruency (congruent/incongruent), facial colors (colored/ neutral), linguistic expressions types (figurative/literal) as fixed effects. We found that there was a significant interaction between congruency and facial colors. Colored faces were judged more quicker than neutral faces. The main effect of expression types was significant, figurative expressions were judged slower than literal expressions. Given these results that facial colors influenced participants' judgment of facial expressions, regardless of linguistic expression types.

PS3.84. DISSOCIATING EFFECTS OF PHASIC AND TONIC ALERTING ON EXECUTIVE CONTROL BY INDIVIDUAL CHRONOTYPES

Martínez-Pérez, V., Palmero, L.B., Campoy, G., & Fuentes, L.J.

Previous research has shown that the alerting and the executive control networks interact. When participants perform a conflict task (flanker task), they usually show faster responses but greater distractor interference on alert compared with no-alert trials. Here, we distinguish between exogenous phasic alerting produced by a warning signal (a tone), and endogenous tonic alerting produced by individual differences in chronotype (time of testing). We classified participants as morning- or evening-types depending on the time of day preferences. This approach allowed us to explore the patterns of alerting and conflict interactions in conditions of maximum and minimum tonic alertness (according to whether participants performed the task in morning and evening sessions), or phasic alertness (with or without the alerting tone). We observed a strong synchrony effect in reaction times. Most importantly, we found an important dissociation between the two types of alertness when assessing the interaction between alertness and executive attention.

PS3.85. SWITCHING ATTENTIONAL DEMANDS AND THE RELATION WITH EXECUTIVE FUNCTIONS AND THE PROCESS OF AGING

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In our modern world, we are constantly faced by an endless array of stimuli, all put different demands on our attentional system and, moreover, require us to permanently switch between these demands. The present study aimed to test relations of the ability to switch between different attentional demands with executive functions as well as the process of aging. In total 176 people (age: $M=58.55 \pm 5.76$ years, range: 21-89) participated. Results show increased reaction times in divided attention compared to selective attention. Switching between demands only increased reaction times in selective attention. Performance in divided attention under single and switching demands significantly correlated with measures of working memory, inhibition, switching between attributes and switching between rules as well as aging. Selective attention under single and switching demands showed similar results, except for working memory and switching between rules. Results highly contribute to previous findings in the field of attention and aging research.

PS3.86. THE LOCUS OF SEMANTIC INTERFERENCE IN THE PICTURE-WORD INTERFERENCE TASK

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Picture naming takes longer in the presence of a semantically related word compared to an unrelated word. This semantic interference effect is of central importance for theory building. Much research has asked whether the locus of the effect is at an abstract lexical or a post-lexical level, but only few studies have tested for a possible pre-lexical contribution. We re-addressed this latter issue by contrasting two tasks differing with respect to the processing stages involved: picture naming (conceptual processing and lexical processing) and natural size decision (conceptual processing only). We predicted interference in naming. If part of the effect is localized at the pre-lexical level, there should be interference in size decision, too. We found effects in both tasks but with different polarity – interference in naming and facilitation in size decision. This suggests that semantic interference has its locus at the lexical level and its origin at the conceptual level.

PS3.87. THE EXPERIENCE AFFECTS THE SEMANTIC: THE CASE OF CHRONIC PAIN IN CANCER PATIENTS

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In a previous study, we demonstrated that semantic content shapes the psycholinguistic and emotional structure of physical and social pain words in a distinct manner. We argue that aspects of pain experience are encoded in the brain and its semantic representation is processed according to this code. Therefore, we hypothesize that the experience of pain affects the way in which we linguistically evaluate pain words. We compared psycholinguistic, affective, and pain-specific norms for 94 pain words on 163 cancer patients on early palliative care (EPC) (96 F; M:66.2; SD:11.5) and on 73 controls (41 F; M:61.1; SD:10.7). Surprisingly, controls evaluated pain words as more negative and physical pain words as conveying a more intense and unpleasant pain. However, evaluation of social pain words was similar between patients and controls. Results support the hypothesis that experience of pain and EPC affect the semantic representation of pain in a consistent way.

PS3.88. INFLUENCE OF ALEXITHYMIA ON THE PROCESSING OF EMOTION WORDS: FOCUSING ON EMOTION WORD TYPES AND TASK CHARACTERISTICS

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Alexithymia is known as a deficit in the cognitive processing of emotion (Taylor et al., 1999). This study investigated which level of processing of emotion words is difficult for alexithymia. Emotion words were divided into emotion-label words (e.g. happy) and emotion-laden words (e.g. success) and were processed on two tasks (Experiment 1: lexical decision task (LDT); Experiment 2: valence decision task (VDT)). The interaction effect between alexithymia and emotion word types was not significant at the LDT but significant at the VDT: the effect of emotion words types disappeared as the alexithymia score increases. The main effect of emotion word types was significant at both tasks: emotion-label words were processed faster than emotion-laden words. The interaction effect appeared at only VDT indicates that the cognitive deficit of emotion words for alexithymia exists not in the level of lexical access but in the level of valence processing.

PS3.89. ELECTROPHYSIOLOGICAL SIGNATURES OF STIMULUS SELECTION AND CONFLICT RESOLUTION IN THE FLANKER TASK

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In the present study, we used a time-frequency EEG decomposition method to measure markers of visuospatial selection and conflict resolution. Third participants performed the flanker task, in which these processes are entailed by incongruence between target and flankers. As the marker of visuospatial selection, we calculated contra-ipsilateral power spectra for alpha frequency (~9-14Hz). As the marker of the conflict processing, we calculated the power of conflict-related midfrontal theta (~4-8Hz). The results showed that the occipitoparietal activity in alpha range was suppressed over the contralateral hemisphere, reflecting attentional modulations at attended hemifield. This alpha effect was significantly prolonged in the conflict trials, suggesting that visuospatial attention is involved in suppression of incongruent flankers. The midfrontal theta power was increased in the conflict trials, reflecting the involvement of executive control in conflict resolution. In conclusion, conflict processing may involve both posterior visuospatial selection and anterior executive control.

PS3.90. DOES ALERTNESS BIAS ATTENTION TOWARDS SALIENT STIMULI?

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Alertness induces a paradoxical effect in conflict tasks (e.g., the global-local task): It decreases reaction time (RT), but amplifies interference from response-incongruent distractors. To explain this phenomenon, some authors have proposed that alertness biases attention towards salient stimuli. In two experiments, I further explored this idea by examining whether alertness also amplifies attentional capture in visual search. Participants searched for a singleton target (Experiment 1: color target; Experiment 2: shape target) amongst distractors. In half of the trials, I presented an additional singleton (Experiment 1: onset singleton; Experiment 2: color singleton), which captures attention due to its salience. To manipulate alertness, I presented a tone before the search display in half of the trials. Both alertness and the additional singleton influenced RT. Yet, their effects did not interact. This result suggests that alertness does not necessarily bias attention towards salient stimuli, at least if they are not response-relevant.

PS3.91. AMBIGUITY DISADVANTAGE IN WORD FRAGMENT COMPLETION TASK

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In the present experiment, we address the question whether semantic ambiguity provokes suppression of the non-selected meaning. We used a modification of the word fragment completion task: participants had to complete and pronounce combinations of Russian adjectives and nouns with missing letters. Combinations were organized in pairs. In the ambiguous condition, the noun could be completed in two ways, but the adjective matched only one meaning (e.g. s(u)xoe (v/k)ino 'dry wine/movie', i(n)te-resnoe (k/v)ino 'interesting movie/wine'). In the unambiguous condition, we used the same combinations (Latin square distribution), but only one correct completion was possible (e.g. s(u)xoe vi(n)o). Three other combinations were presented between the members of the pair. The results show that ambiguous pairs were completed slower and with more mistakes compared to unambiguous ones, especially due to second member of the pair. This supports the central inhibition mechanism hypothesis (Allakhverdov, 2015, Tipper et al, 1994). Supported by RFBR 18-00-00644

PS3.92. ARTIFICIAL GRAMMAR LEARNING AND STARTING SMALL IN DYSLLEXIA

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We aimed to test whether young adults with dyslexia (n=29, MA = 17.3 years, IQ = 108.9; matched on age and IQ at the group level to TD participants) have difficulties extracting abstract patterns from auditory sequences of non-sense syllables in an artificial grammar learning task. We also tested whether incremental presentation of stimuli of different length (Starting Small, n=15) has a facilitating effect on learning compared with presenting strings in random order (n=14). After training, participants were required to decide which member of a sequence pair was more similar to the material heard during training. Overall performance was significantly lower in the dyslexic than in the control group. Starting small did not improve performance in either group. This suggests that abstract sequence learning in the acoustic domain is deficient in

dyslexia, and calls for further studies of training effects potentially enhancing statistical learning in impaired populations.

PS3.93. MODULATION OF COGNITIVE CONTROL IN NUMERICAL STROOP TASK

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This study examines the modulation of cognitive control in the numerical Stroop task. In this task, participants are presented with two digits that differs in their numerical and physical size and are requested to respond which number is either physically or numerically larger. This task entails two effects: the size congruity effect, in which congruent stimuli (the physically larger digit is also numerically larger) are easier to respond compared to incongruent stimuli. The second is the distance effect in which is easier to discriminate between two numbers that are numerically far apart, compared to numbers that are numerically close. We revealed that size congruity effect was modulated by varying the congruency ratio and due to varying the proportions of the numerical distance. However, a different pattern was observed with relation to the distance effect. These observations are further discussed within the context of asymmetrical modulation of control in numerical Stroop.

PS3.94. THE IMPACT OF GRAPHO-MOTOR SKILLS ON GLYPH RECOGNITION: A COMPARISON BETWEEN IMPAIRED AND NON-IMPAIRED HANDWRITING

Seyll, L. & Content, A.

Universite Libre de Bruxelles (ULB)

Recent data suggest that fine motor skills (FMS) play a role in the development of reading. Hampering the FMS of pre-school children while they are learning letters led to lower performance in subsequent decoding than when FMS were not hampered (Suggate et al., 2016). However, those data do not provide any information about the role of FMS in early stages of reading, letter recognition. This is the question examined in the present study. Adults participants learned sets of unfamiliar glyphs either through hampered handwriting or through non-hampered handwriting. An old/new recognition test was administered immediately after learning and again one week later. The new glyphs used in the test were the mirror-images of the learned glyphs. The glyphs learned through non-hampered handwriting gave rise to higher subsequent recognition than those learned through hampered handwriting. Fluent

grapho-motor skills seem thus to be important for glyphs memorisation and representation.

PS3.95. COOPERATIVE AND COMPETITIVE JOINT ACTION: HOW SHARED GOALS TRANSFER FROM ONE TASK TO ANOTHER

Liepelt, R.¹ & Raab, M.^{1,2}

1 Institute of Psychology, German Sport University Cologne, Germany; 2 School of Applied Sciences, London South Bank University, UK

We tested if shared goals two persons have in one task do transfer to another task and if goal transfer depends on whether the goal induction was experienced alone or together with the partner. Before running this Joint Simon task, we set both participants either in a cooperative or a competitive state. We found significant Joint Simon effects for participants that were in a cooperative state and for participants that were in a competitive state. The Joint Simon effect for participants being in a cooperative state was significantly larger than for participants being in a competitive state. When experiencing the goal induction alone the Joint Simon effect was significantly increased as when the induction was done together with the partner. These findings suggest that shared goals can be transferred from one task to another, a finding that was independent of experiencing goal induction alone or together with the partner.

PS3.96. TOWARDS A BETTER UNDERSTANDING OF IMPULSIVITY IN CHILDREN WITH ADHD ?

Grandjean, A.¹, Suarez, I.², DaFonseca, D.³, & Casini, L.¹

1 Aix-Marseille Université; 2 Universidad del Norte; 3 Hôpital Salvator

A deficit in "interference control" is commonly reported in children with Attention Deficit Hyperactivity Disorder (ADHD). This has mainly been interpreted as difficulties in inhibiting inappropriate responses but it could be due to at least two distinct processes involved in impulsivity: a larger susceptibility to trigger automatic responses and a deficit in suppressing them, two non-disentangled processes in most studies. We separately investigated these two processes by using sophisticated analyses of behavioral data complemented by electromyographic activity (EMG). Our work had three main objectives: 1/ to more deeply understand processes impaired in ADHD ; 2/ to investigate the effect of the most often prescribe medication (methylphenidate, MPH) ; and 3/ to evaluate the impact of a behavioral therapy on children with ADHD. The main findings were that 1/ difficulties in interference control mostly reported in ADHD children were due to both a

higher susceptibility to trigger automatic responses and an inhibition deficit, 2/ MPH improved interference control by improving the selective inhibition of automatic responses without modifying the strength of automatic responses, whereas 3/ the behavior intervention program improved interference control by improving these both processes.

PS3.97. WHY CHILDREN ARE SO DISTRACTIBLE? BRAIN DEVELOPMENT OF VOLUNTARY AND INVOLUNTARY ATTENTION FROM CHILDHOOD TO ADULTHOOD.

Hoyer, R., Navarro, M., Masson, R., & Bidet-Caulet, A.

Lyon Neuroscience Research Center, France

A balance between voluntary and involuntary attention supports distractibility. Whereas previous developmental studies about voluntary attention suggest an increased distractibility in children, only a few attempted to behaviorally characterize involuntary attentional changes with age. We wanted to test if the increased distractibility in children result from (i) reduced voluntary attention, (ii) enhanced involuntary attention or (iii) these two patterns. 345 participants from 6 to 25 years-old performed a variant of a Posner task with distracting sounds. Results suggest that exacerbated distractibility in children is related to reduced voluntary attention and enhanced triggering of involuntary attention. In a new study, we recorded EEG data in children and adults (6, 11-12, 18-25 year-old). Analysis of evoked potentials to distracting sounds (orienting N1, P3a) as well as during target expectancy (CNV) and processing (N1, P3b) contribute to identify the developmental trajectory of the brain markers of voluntary and involuntary attention.

PS3.98. DEVELOPMENTAL TRAJECTORY OF NUMBER LINE ESTIMATION AND SPATIAL ABILITIES IN SCHOOL AGE CHILDREN

Van Calster, L.^{1,2}, Heiz, J.¹, Saj, A.^{1,3}, Majerus, S.², Barisnikov, K.¹

1 University of Geneva, Switzerland; 2 Université de Liège, Belgium; 3 University Hospital of Geneva, Switzerland

Numerous studies have investigated the association of number and space, but we still lack precise information about the role of spatial abilities in the developmental trajectory of the mental number line and the construction of numerical representations. The aim of this study was to investigate the developmental trajectory of number line estimation (NLE) and various spatial skills in 174 children aged 5 to 12 years. Results showed a developmental change of NLE and spatial abilities around the age of 7 years and an additional developmental change for NLE only at the age of 10 years. When introducing spatial abilities as

a covariate, the developmental change for NLE at age 10 was no longer observed. These results suggest a joint developmental change in number estimation and spatial abilities at age 7 while numerical representations still heavily rely on spatial abilities at later stages.

PS3.99. CONSECUTIVE TRANSLATION: COACTIVATION AND INTERACTION OF LEXICAL AND SYNTACTIC PROPERTIES

Ruiz, J.O.¹ & Macizo, P.²

1 University of Granada (Spain); 2 Mind, Brain and Behavior Research Center (Granada, Spain)

The aim of the study was to evaluate the possible interaction between lexical and syntactic properties of a target language (TL) in consecutive translation. To this end, participants read sentences in the source language (SL) to either translate them into the TL (reading for translation) or to repeat them in the SL (reading for repetition). The cognate status of words and the syntactic congruency between the SL and the TL sentences were manipulated in different regions of the sentences (initial, middle, and final). The results showed coactivation of the lexical and syntactic properties of the TL at the middle and final regions. In addition, an interaction was observed between the cognate status and the syntactic congruency at the final region of the sentence in the reading for translation task. The pattern of results suggests that the time course of lexical and syntactic activation in translation is interactive.

PS3.100. BODY AWARENESS AND SPONTANEOUS SENSATIONS IN SCHIZOTYPAL PERSONALITY: A RIGHT HEMISPHERE DYSFUNCTION?

Guyot, D., Tarroux, E., Salgues, S., & Michael, G.A.

Université Lyon 2, France

Schizotypal personality provides a construct for understanding schizophrenia and associated symptomatology. With specific reference to body awareness, distorted body perceptions have been reported in both schizophrenia and schizotypal personality, and have been associated with right cerebral hemisphere dysfunction. Assuming that proneness of healthy people to misattribute causality has common neurocognitive origins as false beliefs and hallucinations in schizophrenia, we set out to investigate whether body awareness - as assessed through spontaneous sensations (SPS) - correlated with the Magical Ideation scale (MI) and the Schizotypal Personality Questionnaire (SPQ). We further asked whether this correlation would be lateralized mostly to the left side of the body, suggesting right hemisphere dysfunction. The results confirm that there is a massive left-sided positive correlation between

the MI and SPS, and between the SPQ and SPS. These findings are discussed in terms of dysfunction of multisensory integration processes in the right cerebral hemisphere in schizotypal personality.

PS3.101. MULTIMAP: MULTILINGUAL VISUAL NAMING TEST FOR THE MAPPING OF ELOQUENT AREAS DURING AWAKE SURGERIES

Gisbert-Muñoz, S.^{1,2}, Quiñones, I.¹, Amoruso, L.^{1,3}, Pomposo, I.⁴, Gil-Robles, S.^{4,5}, & Carreiras, M.^{1,2,3}

1 Basque Center on Cognition, Brain and Language (BCBL), Spain; 2 University of the Basque Country, (UPV/EHU), Spain; 3 IKERBASQUE Basque Foundation for Science, Spain; 4 BioCruces Research Institute, Spain, 5 Hospital Quiron, Madrid, Spain

Picture naming tasks are the gold standard for identifying and preserving language-related areas during awake brain surgery. Yet, several major hurdles, including heterogeneity in the selection criteria for stimuli and studies conducted morphologically and typologically diverse languages, hinder effective comparison and generalization of results across studies. Using a picture naming fMRI experiment in a group of bilingual participants, we have demonstrated a distinction between objects and actions, as well as differences between languages, which suggest that both variables are important to map language functions. To facilitate language mapping in awake surgery, we have created the MULTIMAP test for objects and verbs, the first tool designed for multilingual testing. It provides a free, standardized set of up-to-date pictures, where relevant linguistic variables in several languages have been taken into account for their creation and selection, allowing direct comparisons within and between languages. Its usefulness has been behaviorally tested and validated.

PS3.102. THE ROLE OF EXTENDED PRACTICE IN PROCEDURAL LEARNING

Kiss, M.^{1,3}, Németh, D.^{2,3,4}, & Janacsek, K.^{2,3}

1 Budapest University of Technology and Economics, Budapest, Hungary; 2 Eötvös Loránd University (ELTE), Budapest, Hungary; 3 Hungarian Academy of Sciences, Budapest, Hungary; 4 Université de Lyon, Lyon, France

Procedural learning occurs in a gradual and progressive manner through extensive practice. Nevertheless, most studies focused on the early phase of procedural learning (typically occurring in one, relatively short session). Here we aimed to comprehensively characterize how various aspects of performance, including resistance to interference, changes over extended practice. We used the Alternating

Serial Reaction Time task (ASRT) to measure implicit probabilistic sequence learning. There were two experimental groups: the extended practice group (N = 25) performed the ASRT task ten times and the control group (N = 28) performed it once. We found that learning of triplet probabilities (statistical learning) occurs early but increases with practice. In contrast, learning of the higher-order sequence structure emerges later during practice. Additionally, extended practice resulted in greater resistance to interference compared to short practice (in the controls). These findings provide deeper insights into the dynamic changes of procedural learning and performance.

PS3.103. ASSOCIATION OF ADHD SYMPTOMS WITH STROOP-LIKE INTERFERENCE IN THE PICTORIAL ANIMAL SIZE TEST IN SHORT AND LONG RESPONSE-STIMULUS INTERVALS

Ikeda, Y.¹, Haishi, K.², Oba, S.¹, Yashima, T.¹, & Okuzumi, H.³
1 Joetsu University of Education, Japan; 2 Saitama University, Japan; 3 Tokyo Gakuji University, Japan

In the animal size tests, participants are presented with pictures of animals (large animals such as an elephant vs. small animals such as a frog) printed as either big or small images that are mismatched with the animal's real size. Participants must decide the size of the animals (big vs. small) based either on the size in real life (the real animal size test) or the size of the picture (the pictorial animal size test), resisting interference of irrelevant sizes in real life or in a picture. Previous research demonstrated robust interference in the pictorial animal size test and the interference score was high when calculated with RT of the control condition that did not involve task conflict. This study showed the interference was associated with ADHD symptoms in the longer RSI condition but not in the shorter RSI condition, suggesting that ADHD symptoms are related with weak proactive control.

PS3.104. RT_TESTS: A NEW TEST BATTERY TO ASSESS INDIVIDUAL DIFFERENCES IN MENTAL SPEED

Voronin, I.¹, Merzon, L.^{1,2}, & Voronina, I.¹
1 Psychological Institute of Russian Academy of Education, Russia; 2 Higher School of Economics, Russia

Nowadays, computational models, such as diffusion decision model, bring together intra- and inter-individual variability in behavioral measures. However, this approach requires collecting substantial amount of responses from each participant. The assessment is usually performed individually at the lab. We aimed to develop a new battery of cognitive tests that could be used for group cognitive

assessment at schools. The PsychoPy-based battery 'RT_tests' combines six choice reaction time tasks (80-120 trials each) and the framework that controls their execution. The total execution time is limited to 45 minutes. We will present the data from the first launch of the test battery: 171 students aged 10-16 y.o., assessed at school. The pilot version of the battery relied on autonomous OS (Lubuntu) launched from USB-stick on school computers. The research was supported by the Russian Foundation for Basic Research, grant 17-36-01135-OGN.

PS3.105. CONTINGENT EXPERIENCE WITH TOUCHSCREENS PROMOTES THE INTERACTIONAL QUALITY OF MOTHER-CHILD CONVERSATIONS

Okumura, Y. & Kobayashi, T.
NTT Communication Science Laboratories, Japan

Touchscreen devices are characterized as contingent interactive media because they respond in synchronization with a touch behavior. Although recent research has demonstrated that touchscreen devices hold promise for child learning, it remains unclear how parents and children typically use them. We examined the quality of mother-child conversations in which 2-year-olds and their mothers played a publicly available application game on a touchscreen. Our findings demonstrate that both the mothers and children talked more often when the screen afforded contingency with their touches. In addition, the numbers of mother and children utterances were related when playing with a contingent touch, but not with non-contingent touches or viewing the screen without touching it. These findings provide evidence that contingent experiences with touchscreen devices promote the interactional quality of mother-child conversations. Our results not only highlight the practical implications of touchscreens but also guide future design directions for mother-child interactive tools.

PS3.106. MULTILINGUAL TWO-DIGIT NUMBER NAMING: THE INFLUENCE OF COMPOSITION RULES ON LANGUAGE SWITCHING.

Contreras-Saavedra, C., Willmes, K., Koch, I. & Philipp, A. M.
RWTH Aachen University, Germany

We used a two-digit number naming task to explore the influence of composition rules on language switching. 24 German and 24 Spanish native speakers were required to switch between German, English and Spanish. The composition rule of the two-digit numbers was either inverted (all German numbers, English numbers with decade 10) or

non-inverted (all Spanish numbers, English numbers with decade 20). Thus, for English numbers, composition-rule repetitions and switches occurred for both language-repetition and language-switch trials. We observed larger language-switch costs for composition-rule repetitions than for composition-rule switches, suggesting an influence of the composition rule sequence on language switching. Additionally, we observed larger language-switch costs for the non-inverted composition rule than for the inverted composition rule, indicating a dominance of the non-inverted over the inverted composition rule. We discuss our findings in terms of semantic aspects in number processing and relate it to other domains (i.e., word processing).

PS3.107. COMPETING FOR OUR AFFECTION: PERCEPTUAL FLUENCY AND CAMOUFLAGE

Flavell, J.C., Over, H., & Tipper, S.P.
University of York, UK

Human perceptual systems rapidly and efficiently extract information from the experienced world. The fluency of these processes is reinforcing and so misattribution of fluency from the process to the perceived object can lead to liking of that object. However, some critical processes are disfluent yet their resolution can be highly reinforcing (e.g. camouflage) leading to object liking via a different route. Over 5 experiments we explored the relationship between object preference to processing fluency and ambiguity resolution from camouflage. We found that perceptual fluency (from contrast and camouflage) dominates "liking" assessments for objects. However, the disfluent yet reinforcing process of ambiguity resolution overrides perceptual fluency when objects assessments are for "interest". In other words: easy-to-perceive objects are likeable but hard-to-perceive objects are interesting. These results have implications for preference/choice in a range of contexts by demonstrating the relationship between perceptual fluency, process resolution, and the form of preference decision.

PS3.108. INCIDENTAL WORD LEARNING FROM PRINT: THE EFFECT OF SEMANTIC DIVERSITY & CONTEXTUAL FAMILIARITY

Mak, M.H.C., Hsiao, Y. & Nation, K.
University of Oxford

Johns, Dye, and Jones (2016) showed that novel words learnt incidentally in different-themed text passages are able to establish stronger lexical representations than those learnt in same-themed passages, suggesting that words encountered in changing contexts are weighted

more strongly in memory. Notably, the themes of the text passages were quite obscure. Here, we adopted a similar approach to investigate the effect of semantic diversity on word learning but used passages with more familiar themes. Forty-five adults took part in the study. Contrary to Johns et al., novel words learnt in same-themed passages established more accurate and word-like representations, as revealed by differences in word-superiority effect, recognition accuracy, and semantic judgement. We propose that novel words are easier to learn when encountered in repeated themes that are highly familiar, as they form stronger and more reliable connections with pre-existing nodes in semantic memory, thereby securing their representations.

PS3.109. EYE CONTACT DURING INTERACTION WITH A HUMANOID ROBOT MODULATES ALPHA ACTIVITY

Kompatsiari, K.^{1,2}, Bossi, F.¹, & Wykowska, A.¹
1 Italian Institute of Technology (IIT), Italy; 2 Ludwig Maximilian University (LMU), Germany

Eye contact modulates a wide range of cognitive processes in humans, including social attention, memory and arousal. In this study, we examined the effect of eye contact exhibited by a humanoid robot on participants' oscillatory brain activity. To this end, we developed a gaze-cueing paradigm with iCub humanoid robot as gaze cue provider and we manipulated iCub's gaze to be either oriented towards participants' eyes (eye contact) or downward (no eye contact), before the directional shift. Activation in the alpha frequency range [8-12 Hz] was assessed during the entire period of eye contact/no eye contact phase. Participants responded with higher desynchronization of alpha-band activity when the robot established eye contact with them compared to no eye contact condition. Our results show that the eye contact with a humanoid robot modulates humans' oscillatory brain activity, thereby indicating that the robot's gaze might be perceived as a meaningful social signal.

PS3.110. THE LOGOPHORICITY CONSTRAINT ON GERMAN DEMONSTRATIVE PRONOUNS

Patil, U., Meuser, S., & Hinterwimmer, S.
University of Cologne

German demonstrative pronouns, DPros, (die, der, das) and personal pronouns, PPros, (sie, er, es) exhibit contrastive behavior in terms of their antecedent preference -- PPros prefer discourse topics as antecedents while DPros avoid them. Hinterwimmer and Bosch (2017) argues that DPro are anti-logophoric and avoid discourse topics

because topics are default perspective-holders, however, in the presence of a prominent narrator, the narrator should become the perspective-holder and hence the discourse topic should become available as an antecedent. We carried out two eyetracking studies (n=78) in the visual-world paradigm that tested this hypothesis. Participants heard 3-sentence stories that first introduced two referents and later a DPro which could refer to either of the two. The gaze patterns at the onset of the DPro revealed that in the control condition the topical referent was clearly dis-preferred by the DPro, but in the prominent-narrator condition it became more available for the DPro.

PS3.111. SEX DIFFERENCES IN VISUAL SPATIAL PERSPECTIVE TAKING AND PERSPECTIVE SWITCHING

Geva, D. & Henik, A.

Ben-Gurion University of the Negev, Israel

Men were found to outperform women in visual-spatial abilities, particularly in mental rotation, due to their efficient strategy preferences. It was shown that in a level 2 visual-spatial perspective taking (VSPT) task, women tended to use strategies involving body schema, whereas men used more analytic strategies. We investigated sex differences in a level 2 VSPT task—dots perspective taking—that enables indicating strategies involving body schema. Our findings reinforced that men perform better in VSPT tasks, and women tend to use more body schema. We also explored sex differences in perspective switching using our task. Perspective taking is the ability to move between egocentric and altercentric perspectives. Perspective switching studies in the visual-spatial domain so far used level 1 VSPT tasks, and showed perspective switching has a cost in response time. We demonstrated the switching cost men have in accuracy when moving from an egocentric to an altercentric perspective.

PS3.112. POLISH NORMALISATION OF THE SELECTED TESTS FROM THE VIENNA TEST SYSTEM

Urbanski, M., Urbanska, J., & Skrzypczak, N.

Adam Mickiewicz University, Poland

The objective of the research was to collect representative norm samples for a number of tests included in the Vienna Test System: 2HAND, AMT, CORSI, 2D, 3D, STROOP, LVT, SIGNAL, RT, COG, DT, AHA, ZBA, SIMKAP. The data were collected between October, 2016 and May, 2018. 352 subjects took part in the research, with the demographic characteristics balanced with respect to age, gender, and education level, as determined on the basis of 2015 census by Statistics Poland. In the poster we present detailed

procedure for the data collection, along with some difficulties we encountered on the way. We report also the resulting norms for the Polish population, the tests' psychometric properties and some correlations between the results.

PS3.113. DEVELOPMENTAL CHANGES IN CONSTRUCTING AND UPDATING SPATIAL REPRESENTATIONS

Michaelides, C., & Avraamides, M.

University of Cyprus

Current study aimed to experimentally assess the ability of children at various ages (6-,7-,8-,9-,10-,11-year olds) and adults (19-,35-,60-year old) to accurately represent the positions of multiple objects and update these memorized representations, in order to characterize the developmental trajectory of spatial updating ability. Participants studied an array of 4 objects placed at predetermined locations on the circumference of a 3m-round carpet. Once they memorized it and while blindfolded, in the orientation phase, they were asked to point to the objects from the initial learning orientation. Subsequently, in the updating phase, they were again asked to point to the objects after a 45-degree physical rotation. By comparing different directional error measures (i.e., constant, pointing and variable error) for the orientation and the updating phase across the 9 different age-groups, we were able to assess the developmental trajectory of this spatial ability.

PS3.114. THE PRICE OF PAYING ATTENTION: THE ORIENTING REACTION IS LARGER WHEN ATTENTION IS AMPLIFIED
Takács, E.^{1,2}, Altbäcker, A.¹, Barkaszi, I.¹, Czigler, I.^{1,2}, & Balázs, L.¹

1 Hungarian Academy of Sciences, Hungary; 2 Eötvös Loránd University, Hungary

The strength of orienting reaction might be dependent on the direction and intensity of attention. In this study we tested if varying the intensity of attentional processing affects the neural sign of orienting, the P3a ERP component. Participants performed a match-to-sample task in which the physical size of two successive stimuli had to be compared. A cue stimulus presented at the beginning of the trial predicted the difficulty of the comparison (easy or hard). In the blockwise task version, cues and task difficulty were varied between the 6-minute-long task blocks, while in the trialwise version on a trial-by-trial basis. Rarely, an irrelevant stimulus was presented instead of the second stimulus to elicit P3a. Results confirmed our hypothesis: P3a elicited by irrelevant stimuli was amplified in hard compared to easy task conditions. Results support the

notion that the neural sign of orienting reaction is sensitive to the intensity of attentional processes.

PS3.115. THE EFFECTS OF STIMULUS ONSET ASYNCHRONY ON THE ITEM-SPECIFIC PROPORTION CONGRUENCY EFFECT IN A PICTURE-WORD STROOP TASK

Misirlisoy, M.¹, Atalay, N.B.², Bozkurt, O.¹, & Tanyas, H.¹
1 Middle East Technical University (METU), Turkey; 2 TOBB University of Economics and Technology

The item-specific proportion congruency (ISPC) effect is demonstrated by a larger Stroop effect for mostly congruent (MC) items compared to mostly incongruent (MI) items. In previous studies, we showed that the ISPC effect changed as a function of stimulus onset asynchrony (SOA). Specifically, the ISPC effect was observed for the -200 ms (word-first), and 0 ms (simultaneous) conditions, but disappeared in the +200 ms (color-first) condition. The aim of the current study was to conceptually replicate and extend these previous findings to a picture-word Stroop task. Results showed that the ISPC effect changed as a function of SOA, supporting our previous results. Specifically, the ISPC effect was observed for the -200 ms and 0 ms conditions, but not when the word came too late (+200 ms). Taken together, these results suggest that the ISPC effects observed with color-word and picture-word Stroop tasks might have similar underlying mechanisms.

PS3.116. THE LANGUAGE-DEPENDENT INFLUENCE OF NUMBER WORDS ON TRANSCODING.

Steiner, A.F.¹, Clayton, F.J.², Göbel, S.M.², & Landerl, K.¹
1 University of Graz, Austria; 2 University of York, UK

Transcoding of multi-digit numbers is challenging for children in early primary school. The language-specific property of decade-unit inversion (e.g., German “fünfundzwanzig” is literally translated as “five-and-twenty”) affects place value understanding, which is crucial for further arithmetic development. Recent studies suggest a lasting impact of number word structure on transcoding. We tested language-dependent differences in cross-modal matching of two-digit numbers and its relationship with arithmetic. In a cross-sectional design, 148 German- and 245 English-speaking 2nd graders and 28 German- and 35 English-speaking adults performed a computerized number-matching task. They decided whether a spoken number matched the visual Arabic number. Distractors contain same but inverted digits or unrelated digits. Response times revealed that German speakers were more distracted by inverted units than English speakers were. Moreover, transcoding performance correlated with

performance in an arithmetic fluency task across languages. Findings support the notion of persistent language-specific syntactic procedures on transcoding.

PS3.117. THE EMERGENCE OF TOP-DOWN SEARCH TEMPLATES: INSTRUCTION VS. REINFORCEMENT LEARNING

Grüner, M., Goller, F., & Ansorge, U.
University of Vienna, Austria

We investigated whether top-down search templates for target-defining features can be established via reinforcement learning of the search rule alone, that is, without instruction to search for a specific target feature. In a spatial cueing experiment, participants reported the orientation of a T inside the target stimulus without knowing which exact feature defines the target. Via trial and error, they learned that a specific color defines the target. After the learning block, they were explicitly instructed to search for the same color to find the target. In both blocks, cues matching the searched-for target features elicited cueing effects (faster reaction time when the cue appeared at the same position as the target, compared to a different position), whereas non-matching cues (without a searched-for feature) did not. In the learning block, the cueing effect built up over the first 150 trials, before remaining stable for the rest of the block.

PS3.118. THE EFFECT OF IMITATING VERSUS SEEING GESTURES WHEN ACQUIRING VERBS AND NOUNS

García-Gámez, A.B.¹, & Macizo, P.²
University of Granada, Spain

In this study, we evaluated the impact of seeing vs. performing gestures on the acquisition of verbs and nouns in a foreign language. Participants learned new words in isolation or coupled with videos depicting meaningless gestures and gestures with the same/different meaning than the word to be learned (congruent/incongruent condition). Furthermore, participants had to see the gestures only (seeing condition), or see the gestures and reproduce them (imitation condition). After training, participants performed a forward and backward translation task to evaluate the learning process. Overall, vocabulary acquisition was higher in the congruent condition compared to the rest of gesture conditions. However, the performance of gestures had a different effect depending on the type of word. Performing gestures facilitated the acquisition of verbs but made difficult the learning of nouns. These data are discussed around the effect that the addition of sensorimotor information has during the learning of new words.

PS3.119. EFFECTS OF MATH-ANXIETY ON ARITHMETICAL TASK-SWITCHING

González-Gómez, B.¹, Núñez-Peña, M.I.^{1,2}, & Colomé, À.¹
 1. *University of Barcelona, Spain*; 2. *Sant Joan de Déu Research Institute, Spain*.

Attentional Control Theory (ACT) proposes that anxiety mostly affects two central executive functions related with attentional control: inhibition and shifting. We aimed to investigate whether math-anxiety also affects the shifting function by using a task-switching paradigm. Twenty highly math-anxious (HMA) and 20 low math-anxious (LMA) participants verified additions and subtractions on two two-digit numbers preceded by a transition cue. At the beginning of each trial, the cue indicated whether to repeat or to switch the arithmetical task. HMA individuals were slower than their LMA peers. More interestingly, there was a Switch x Group interaction, with the HMA group showing a stronger switch cost when verifying additions than their LMA peers. These data suggest that the low processing efficiency shown by HMA individuals in arithmetical performing might be related to difficulties when shifting their focus of attention.

PS3.120. WHAT MODULATES THE ACHIEVEMENT IN AN INFERENTIAL, VISUO-SPATIAL ENVIRONMENT

Russo, G., Tessari, A., Farnè, M., Gatta, G., & Ottoboni, G.
University of Bologna, Italy

In inferential environments, people make decisions on the base of outcomes predictions: the more they become acquainted, the more the levels of confidence increase. At the moment, the role of psychological traits or superior cognitive functions is still unclear. Through a novel visuo-spatial decision-making task we begin to disentangle the role of these factors: due to the stochastic nature of the task, we assumed that personality traits affect achievements more than intelligence. Forty-two healthy participants performed a visuo-spatial decision-making task demanding for profit maximization, and responded to Raven-APM, EPQr and STAI tests. No effects of anxiety or personality emerged. Only Raven guided task performance: participants with higher score maximized their responses more than who showed lower, but still within normality, score. However, this emerged only within a variability threshold. The present experiment formalizes how environmental variability constrains the role of intelligence in extracting information from a visuo-spatial inferential task.

PS3.121. SCAFFOLDING MAINTENANCE STRATEGIES IN PRESCHOOLERS' VISUAL WORKING MEMORY

Camos, V.¹, Fitamen, C.^{1,2}, & Blaye, A.²
 1 *Université de Fribourg, Switzerland*; 2 *Université Aix-Marseille, France*

Working memory development throughout childhood is a major predictor of cognitive development and school achievement. Noticeably, preschoolers exhibit poor performance due to an absence of use of maintenance strategies before 7 years of age. In the present study, we examined how the scaffolding of maintenance strategies by location cues can improve working memory performance in 3- to 6-year-old preschoolers. In a complex span task, children had to memorize the location of a teddy bear who moved from one house to another, while they judged the upward/downward position of the bear in each house. During the retention interval, either houses disappeared or remained on screen, providing some location cues. Our findings showed that preschoolers benefitted from the location cues, this effect remaining similar across age groups. These results suggest that working memory performance can be improved in preschoolers when the task embeds elements that can scaffold their maintenance strategies.

PS3.122. MODALITY DIFFERENCES IN THE COGNATE EFFECT

Frances, C.¹, Navarra-Barindelli, E.¹, & Martín, C.D.^{1,2}
¹ *Basque Center on Cognition, Brain and Language (BCBL), Spain*; ² *Ikerbasque, Basque Foundation for Science, Bilbao, Spain*

Bilingual language perception studies classically reveal that cognates (words sharing form and meaning across languages) are easier to process than non-cognates (words sharing only meaning), referred to as the cognate effect. This effect is well described for orthographic similarity, in the visual modality, but few studies have evaluated it in the auditory modality. In this study, late highly proficient Spanish-English bilinguals carried out a lexical decision task in their second language—both visually and auditorily. Words were either phonological cognates (PC) or non-cognates and orthographic cognates (OC) or non-cognates (fully crossed). In the visual modality both PC and OC improved performance. In contrast, there was an interaction between OC and PC in the auditory modality. Aurally, OC reduced accuracy for phonological non-cognates and did not affect cognates. This suggests that processing cognates is categorically different by modality, with OC in the auditory domain making word identification more difficult.

Poster session 4

Espejos Hall

Saturday 28th
11:40-13:10

PS4.1. FALSE RECOGNITION REDUCTION EFFECTS INDUCED BY ANODAL TRANSCRANIAL DIRECT CURRENT STIMULATION (TDCS) AND ITS RELATION TO DIFFERENT MEASURES OF EXPECTED SPREADING ACTIVATION FOR CRITICAL WORDS

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Recent research in our laboratory (Díez et al., Cortex, 2017) has provided evidence that anodal tDCS of the left anterior temporal lobe (ATL) while studying word lists can reduce the rate of DRM-induced false memories, an effect specifically linked to associative lists, but not to categorical lists. This anodal reduction effect is also linked to a change in the correlational pattern between false recognition and strength/connectivity features of the lists. In the present work, we computed the expected degree of activation of the critical words according to different models of spreading activation, and then we explored how tDCS (sham, anode, cathode) affected the correlation between false recognition and those activation measures. The approach was used on the data from four experiments that manipulated electrode localization in the temporal lobe (anterior-posterior) and time of stimulation (study-test). Results are discussed in the framework of distributed-plus-hub views of the ATL.

PS4.2. DIVIDED ATTENTION FROM SPEECH PLANNING DOES NOT ELIMINATE REPETITION PRIMING FROM SPOKEN WORDS: EVIDENCE FROM A DUAL-TASK PARADIGM

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Production and comprehension partly overlap in conversation. However, dividing attention between tasks often results in worse performance on one or both tasks. While comprehension has been shown to have deleterious effects on concurrent production, it is unknown whether the reverse also holds. We investigated if production affects

word encoding during comprehension in a priming experiment. Participants first heard primes in full attention (Experiment 1) or while naming a distractor (Experiments 2 and 3), then named unrelated or identical target pictures. We varied the number of trials between prime and target: 0 (no-delay), 10 or 50. Latencies were shorter when prime and target were identical than when they were unrelated. The priming effects decreased with prime-target delay but, importantly, the priming effects were comparable across experiments. Shallow encoding is often enough to yield priming. We conclude that during linguistic dual-tasking the comprehended stimulus is (at least partly) encoded, leaving priming unaffected.

PS4.3. THE EFFECT OF INTENTION TO LEARN ON THE ACQUISITION AND CONSOLIDATION OF STATISTICAL AND SEQUENCE KNOWLEDGE

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Procedural learning involves the acquisition of statistical and sequence knowledge. Both processes can occur intentionally or incidentally. However, it is still unclear, how the mode of learning alters these sub-processes during procedural learning and consolidation. We aimed to test this question in a unified paradigm. Young adults completed the Alternating Serial Reaction Time task, which measures statistical and sequence learning in parallel, occurring either incidentally (N = 37) or intentionally (N = 37). Performance was retested after a 12-hr delay, including sleep for one half of the participants (PM-AM design) or daily activity for the other half (AM-PM design). The mode of learning did not affect statistical learning or its consolidation. In contrast, intention to learn enhanced sequence learning but did not modulate its consolidation. Additionally, delay activity (sleep/wake) had no effect on performance. Our results help uncover how the mode of learning and sleep affects procedural memory formation.

PS4.4. MODELING ORTHOGRAPHIC LEARNING OF NEW WORDS IN BRAID, A BAYESIAN MODEL OF VISUAL WORD RECOGNITION.

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We present an extension of BRAID, a Bayesian model of expert word recognition, to model the acquisition of new orthographic knowledge. To a classical three-layer architecture, BRAID adds an original attentional component, allowing to control how attention is deployed on the word stimulus. To model orthographic learning, we assume that visual attention is distributed over the letter string so as to optimize the accumulation of perceptual information about letters, to construct efficiently a new orthographic memory trace. Furthermore, we assume that letter perception is influenced by lexical knowledge, in a top-down manner modulated by the probability that the stimulus presented is a known word. In this study we simulate observations from an eye-tracking experiment involving repeated reading and implicit learning of thirty French new 8-letter words. Results show that the model successfully reproduces the decrease of the number of fixations and of processing time we observed along repetitions."

PS4.5. THE ROLE OF BREADTH OF ATTENTION AND WORKING MEMORY CAPACITY IN MEDIA MULTITASKING BEHAVIOUR

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On average, American youth spend 7.5 hours, every day, with media (Uncapher, et al., 2017). 29% of that time is spent processing different forms of media simultaneously. This type of activity is called media multitasking. There are a lot of studies exploring the relationship between media multitasking behaviour and cognitive processes. Some of them have found that increased media multitasking is associated with poorer performance on various cognitive tasks (Edwards, Shin, 2017). Other studies, however, have not replicated this effect (e.g. Minear, Brasher, McCurdy, Lewis, Younggren, 2013). The aim of this study was to find a correlation between media multitasking, breadth of attention and working memory capacity (measuring by OSPAN and N-back task). The results showed that there is a relation between media multitasking and breadth of attention and no correlation between media multitasking and working memory capacity. The implications and future aims of the research will be discussed.

PS4.6. THE EFFECT OF STIMULUS LIST COMPOSITION ON THE REVERSED DISTANCE EFFECT IN DIGIT ORDER PROCESSING

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Order tasks in which participants have to indicate whether a sequence of digits (135) is presented in an order are strongly related to arithmetic performance. The reversed distance effect (RDE) is considered to be a robust effect in order tasks: participants react faster to ordered sequences with small distances (123) than ordered sequences with large distances (159). In a recent study, no RDE was observed. Therefore, we examined to which extent the presence of the RDE is dependent on the stimulus list composition. Participants performed two order tasks: in one task regular ordered and non-ordered sequences were included (135). In the other task, irregular sequences were added (136). Results showed that the RDE was only present when participants started with the task with only regular sequences suggesting that the presence of the RDE and the strategies that are used in the order task are dependent on the stimulus list composition.

PS4.7. THE SAME OR DIFFERENT? CAPACITY LIMITATIONS IN VISUAL IMAGERY VERSUS VISUAL MEMORY OF SIMPLE STRUCTURED OBJECTS

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Visual mental imagery and visual memory appear to utilise similar brain networks (Tong, 2013). However, limited research has investigated how similar the systems are in terms of capacity limits. Capacity limits of visual working memory (VWM) and visual short-term memory (VSTM) have been the focus of considerable research, but to our knowledge none has attempted to ascertain the number of objects that can be simultaneously imagined. This study aimed to provide estimates of imagery capacity and explore how this relates to the capacity of visual memory. Participants completed three tasks that explored imagination, VWM and VSTM, respectively. Set size was manipulated similarly in each task enabling modelling of imagination and visual memory capacity. Capacity estimates were similar in the two visual memory tasks and higher than that of imagination. The relations between these tasks are discussed alongside the theoretical implications about the mechanisms underpinning imagery and visual memory.

PS4.8. PULSE RATE AND EMOTION PERCEPTION BETWEEN COUPLES WHEN WATCHING MOVIES: PRELIMINARY FINDINGS FOR UNDERSTANDING THE MECHANISMS OF PHYSIOLOGICAL SYNCHRONY

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Primary drivers of evolution of human species is to form social connections with others (Tomasello et al., 2005). Living in social isolation leads to numerous diseases (Marmot et al., 1976), whereas close relationships are known to reduce risks of mortality (Uchino et al., 1996). Physiological synchronization facilitates cooperation, and providing feedback of physiological signals, such as pulse rate, are known to increase group coherence (McCraty, 2017). The objective of this research was to understand the mechanism of physiological synchrony, specifically through observing pulse rate synchrony between romantic vs. non-romantic dyads when watching love-romance and action movies. In addition to the physiological measures, emotion ratings of the movies were also considered. The emotion ratings suggested there are no differences between couples and non-couples. However, the physiological measures showed that couples synchronized more than non-couples. The preliminary results served as a base to understand the relation of synchrony and close relationships.

PS4.9. THE IMPACT OF COGNITIVE TRAINING OF WORKING MEMORY, EXECUTIVE ATTENTION AND EXOGENOUS ATTENTION ON WORKING MEMORY CAPACITY

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Despite a wave of criticism, working memory (WM) training seems to be the most effective means of correcting cognitive dysfunctions and stimulating cognitive development of healthy people, of all the means that have been tested so far. It is not surprising that WM training improves WM capacity, however, the question arises if this influence is greater than in the case of other forms of training. It can be expected that executive functions training – in line with current WM theories – should also improve WM capacity, while exogenous attention training should not have such an impact. In the conducted research, four groups were subjected to, respectively, WM training (n=64), executive functions training (n=72), attention training (n=67), and placebo training (n=70). The results indicate that executive functions training has at least the same impact on WM capacity as WM training has, while the impact of attention and placebo training is not significant.

PS4.10. ERRORFUL LEARNING IN CONTEXT

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Learning is often thought to be most beneficial when it progresses without errors. However, recent research suggests that incorrect guesses can facilitate future learning of correct answers. One issue that determines the effectiveness of learning through guessing is the timing of the presentation of the correct answer (feedback): it can be presented either immediately after the guess, or after a delay. Whereas the timing of feedback is of little importance for complex materials such as general knowledge questions, for simpler materials such as word pairs guessing benefits learning only when feedback is immediate. As word pairs, compared to facts, are relatively sparse in context, we enhanced the richness of the contexts associated with those pairs by adding background pictures. Using this background context manipulation, in two experiments we have shown how and when the memory benefits of guessing can be found even when feedback is delayed.

PS4.11. TEMPORAL PREPARATION FACILITATES BOTTOM-UP SALIENCE RATHER THAN TOP-DOWN INHIBITION OF DISTRACTORS IN VISUAL SEARCH

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Previous studies have shown that temporal preparation facilitates target selection in visual search. In an event-related potential (ERP) study (N=24) we investigated whether this selection benefit is due to an increase in bottom-up salience or an increase in top-down control. We varied temporal preparation in a blocked foreperiod paradigm, and we required participants to search for an orientation pop-out (target) while ignoring an additional colour pop-out. We observed that temporal preparation led to faster reaction times to targets. In the ERP, we did not observe an effect of temporal preparation on the Distractor Positivity (Pd), an index of top-down distractor inhibition. Instead, we observed that temporal preparation enhanced the distractor-evoked N2pc, an index of attentional orientation towards a stimulus. These results suggest that temporal preparation does not affect top-down inhibition of distractors. Instead, they suggest that temporal preparation increases bottom-up salience regardless of the task-relevance of a stimulus.

PS4.12. INTENTIONAL FORGETTING IN THE SOCIAL DOMAIN: HOW FORGETTING AFFECTS IMPRESSIONS AND ATTITUDES WE FORM ABOUT OTHERS

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In two studies, we assessed how the instruction to forget affects (a) memory for behaviors, (b) endorsement of traits that could be inferred from behaviors, and (c) attitudes about the individuals associated with the behaviors. In Study 1, participants were cued to selectively forget or remember several face-behavior pairs. In a memory test, fewer forget- than remember-cued behaviors were recalled. However, there was no effect on inferred traits, demonstrating that first impressions prevail even when specific behaviors are forgotten. In Study 2, participants learned about several negative behaviors of a person and were instructed to forget or to remember these before they learned neutral behaviors of a second person. In a delayed but not an immediate test, the forget group recalled fewer Person 1 behaviors and judged Person 1 less negatively than the remember group. This shows that attitudes can be affected by intentional forgetting, particularly after time has passed.

PS4.13. AN ELECTROMYOGRAPHIC ANALYSIS OF THE EFFECTS OF COGNITIVE FATIGUE ON REACTIVE AND PROACTIVE ACTION CONTROL

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Complex activities require a sustained mental effort that causes cognitive fatigue. This fatigue may be the source of errors by disrupting action control. In this study, we examined its effects on reactive and proactive action control. Two groups performed a Simon task (a conflict task) after completing a fatigue-inducing task (a dual task combining a 2-back task and a parity judgment task, Borrağan et al., 2017) in which the cognitive load was high or low. In order to measure reactive and proactive control, we evaluated the correction rate, distributional analyses and the Gratton effect based on electromyographic analyses. We observed that fatigue have only impaired proactive control. Participants in the high load condition were less able to adjust their behavior after observing a conflict. These results are in line with previous studies which posit a change to less demanding strategies when participants became mentally fatigued.

PS4.14. RECIPROCAL EFFECTS OF INTERPERSONAL REGULATION DISTANCE AND ACTION TENDENCIES IN AN EMOTIONAL CONTEXT

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During social interactions, interpersonal distance plays a crucial role and needs to be regulated depending on emotion expressed by others. Here, we examine in healthy adults interactions between emotion perception and approach-avoidance tendencies. First, by using a passive perception task with postural recordings, we show that the simulated behavior of others (faces approaching or withdrawing) expressing different basic emotions (joy, fear, anger, sadness, disgust and neutral) influences participant's postural control and their action tendencies. In return, by using an active computerized stop-distance task, we demonstrate that the participant's action tendencies modulate the distance judged adequate for a social interaction (i.e., participants prefer a greater interpersonal distance for angry faces and a shorter distance for happy faces). Results are discussed in light of the approach-avoidance model, by considering how some personality traits (e.g. extraversion, neuroticism, aggressiveness, anxiety) modulate the relation between emotion and posture.

PS4.15. EMOTIONAL MODULATION OF ITEM AND SOURCE EPISODIC MEMORY IN SCHOOL-AGE CHILDREN

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Emotional Enhancement of Memory (EEM) has been well demonstrated in adults, but little is known about EEM in episodic memory for school-age children. Considering some developmental and aging studies, some difference may be expected. Our study tested the impact of emotional valence, negative and positive, of words and pictures on item and source episodic memory across two experiments. Sixty 8- to 11- years old children were tested and compared to young adults. Participants completed an intentional-encoding task followed by source recall and free item recall tasks. Results displayed:¹ better recall of positive and negative words and their associated source relative to neutral words, in both experiments, for children and adults, and² in Experiment 1, better item memory for negative pictures in children and in Experiment 2, better item memory for negative and positive pictures and better source memory for positive pictures only for both, children and adults.

PS4.16. THE IMPACT OF STUBBORNESS ON INTERNALLY- AND EXTERNALLY- GUIDED DECISION-MAKING

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The decision-making process has been investigated separately in the contexts of internally-guided decision-making (IDM, e.g., preference judgment) and externally-guided decision-making (EDM, e.g., gambling task). In both lines of research on decision-making, stubbornness (i.e., the tendency to repeat the same decision) is known to affect decision-making. However, it is unclear whether stubbornness consistently affects these two kinds of decision-making. To elucidate the effect of the degree of stubbornness on these two types of decision-making, we conducted IDM (i.e., shape preference) and EDM (i.e., feedback-based learning) tasks by presenting novel contour shapes. The degree of stubbornness during IDM and EDM was estimated by applying computational model analysis. The results of the present study demonstrated that participants with high stubbornness in EDM show low stubbornness in IDM.

PS4.17. PERCEPTUAL FOUNDATIONS OF EUCLIDEAN GEOMETRY

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Euclidean geometry defines objects that can be realized in space, and may therefore be founded in spatial perception. We investigated whether the perception of small, 2-dimensional visual forms could provide cognitive foundations for Euclidean knowledge, by asking two questions. First, are humans sensitive to form variations that are relevant to Euclidean geometry (e.g. changes in angle)? Second, can observers easily disregard variations that are irrelevant to Euclidean geometry (e.g., changes in scale)? Participants from the U.S. (age 3-34 years) and from the Amazon (age 5-67) were asked to locate deviants in panels of 6 forms of variable orientation. Results indicate that perception of forms aligns with a restricted version of Euclidean geometry, where forms are defined in terms of metric proportions and global size, but mirror images are assimilated. Moreover, children below 6 did not clearly analyze forms in terms of the shape property of angle.

PS4.18. ATTENTION: DIFFERENT ROLE IN INTENTIONAL AND INCIDENTAL BINDING IN WORKING MEMORY?

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Within working memory, the role attention plays in maintaining feature bindings remains under debate. Most studies conclude that attention is not necessary to keep features associated. Yet, a number of studies suggests that attention is the glue that keeps features associated. In the present study, we examine the intentionality of the binding as a specific contextual factor that might be responsible for these contradicting results. In an intentional binding paradigm, participants should remember all of the features as well as their associations. In an incidental binding paradigm, participants should remember all of the features, with no requests regarding their associations. It is, however, frequently observed that the association is maintained in both paradigms. Here, we test the hypothesis that reducing the attentional resources results in the specific loss of feature bindings in the incidental binding paradigm, but not in the intentional binding paradigm.

PS4.19. TRANSCODING AS A FOUNDATION FOR ARITHMETIC DEVELOPMENT: EVIDENCE FROM A LARGE LONGITUDINAL STUDY IN TWO LANGUAGES

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There is ongoing debate over which skills best predict mathematical achievement. The ability to translate accurately and efficiently between Arabic digits and spoken number words may be an important contender. However, few studies have directly compared transcoding performance with other established domain-specific and domain-general predictors of arithmetic. We tested 169 German-speaking children and 264 English-speaking children across the first two years of primary school. These languages provide a useful comparison as in English number words the order of tens and units (e.g., forty-two) follows the written order of the Arabic digits (e.g., 42), whereas in German number words are inverted (e.g., two and forty). Results revealed transcoding was a significant longitudinal predictor of arithmetic performance in both language groups, even when controlling for a range of domain-general and domain-specific measures including working memory, phonological awareness and symbolic and non-symbolic number comparison.

PS4.20. HOW THE RELATIVE BALANCE BETWEEN LANGUAGES AFFECTS LANGUAGE INHIBITION: L2-AFTER EFFECTS IN UNBALANCED BILINGUAL SPEAKERS

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Prior usage of a second language (L2) usually leads to processing costs on the subsequent production in the native language (L1). This is known as the “L2-after effect” and most likely reflects L1 inhibition that occurred during L2 production. We tested if the magnitude of L2-after effects depends on the relative balance between the activation of L1 and L2 lexical representations. Polish learners of English named a set of pictures in L1 following a set of different pictures in either L1 or L2; their relative language balance was assessed via naming latencies in L1 and L2. As expected, L1 naming was slower after L2 than after L1. Moreover, the more language-unbalanced participants were, the larger the magnitude of the L2-after effect was. This provides direct evidence that language inhibition changes the temporary level of L1 activation and that involvement of inhibition is greater in more unbalanced bilinguals.

PS4.21. VIOLENT VIDEO GAMES AND SHOOTER BIAS: HABITUAL VIDEO GAME PLAYERS MAKE FASTER DECISIONS WITHOUT ANY COMPROMISES IN ACCURACY

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Correll and colleagues (Correll, Park, Judd, & Wittenbrink, 2002) developed a first-person shooter task that simulates the police officer's dilemma whether to shoot or not a target that may present lethal danger. The present study examined the relationship between habitual violent video game play and responses in this shooting paradigm. Habitual violent video game play has been shown to increase the accessibility of aggressive thoughts. Previous research also demonstrated that action video game play has a positive impact on perceptual skills. Hence, it was hypothesized that players of violent video games would be more likely to mistakenly shoot a target and exhibit shorter reaction times in the shooting task. Results revealed that reaction times, but not error rates, were significantly associated with habitual violent video game play. These findings suggest that habitual violent video game play may have a positive impact on overall processing skills without limiting accuracy.

PS4.22. IS EMOTIONAL ATTENTION A BEHAVIORAL MARKER OF AMYGDALA ALTERATIONS IN ALZHEIMER'S DISEASE?

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The amygdala, a limbic area crucial in potentiating emotional processing, is atrophied early in Alzheimer's disease (AD). Yet, the consequences of amygdala alterations on the processing of emotional information in patients with AD are still scarcely investigated. Recent behavioral and neuroimaging data suggest that emotional attention may be a promising way of investigation. In this study, we were interested in assessing the link between amygdala structural and functional alterations and automatic emotional attention toward salient features of faces. Based on previous reports in patients with amygdala lesions, we also investigated the existence of compensatory processes relying on frontal networks and allowing the preservation of more controlled emotional attention mechanisms. Preliminary results will be discussed.

PS4.23. EPISODIC CONSTRUCTION IN SPONTANEOUS THOUGHT: TESTING THE IMPACT OF AN EPISODIC SPECIFICITY INDUCTION IN YOUNGER AND OLDER ADULTS

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In the present study we analyze age-related changes in spontaneous task-unrelated thoughts (TUTs) focusing on qualitative differences, particularly episodic specificity. Twenty-four younger and 24 older adults performed an easy vigilance task including words and were periodically stopped to describe their mental contents. Thoughts classified by the participants as spontaneous were coded and analyzed for episodic specificity. Additionally, participants were compared in a control condition and after an episodic specificity induction that has consistently been shown to target episodic construction. Preliminary results with the younger sample suggest that spontaneous TUTs are more frequently episodic than semantic after the specificity induction. The reverse pattern was observed for the control condition. In presenting the results, we explore the theoretical implications of the role of episodic construction in spontaneous TUTs and discuss how functions associated with specific spontaneous thoughts may be affected by aging in daily life (e.g., emotion regulation).

PS4.24. HIGH DEFINITION TRANSCRANIAL DIRECT CURRENT STIMULATION OF THE DORSOLATERAL PREFRONTAL CORTEX DOES NOT MODULATE IMPLICIT TASK SEQUENCE LEARNING AND CONSOLIDATION

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The incidental acquisition of a succession of tasks is termed implicit task sequence learning. Patients with dorsolateral prefrontal cortex (DLPFC) lesions are strongly impaired in this ability. However, recent results of conventional transcranial direct current stimulation (tDCS) above the DLPFC showed no modulation of implicit task sequence learning and consolidation. One explanation is that conventional tDCS has non-focal effects on the cortex. The aim of the present study was to use focal tDCS, namely high definition tDCS (HD-tDCS), to influence implicit task sequence learning and consolidation. Participants received DLPFC HD-tDCS during implicit task sequence learning and, 24 hours later, consolidation was measured. Results showed that sequence learning was present in all conditions and sessions. Furthermore, consolidation was robust. Yet, stimulation did not modulate sequence learning and consolidation. Hence, this study corroborates previous findings by showing that even focal HD-tDCS is not sufficient to modulate implicit task sequence learning and consolidation.

PS4.25. ESTROOP: A DIGITAL RENEWAL OF THE TRADITIONAL CONFLICTING PROCESSES MEASURE

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Several different Stroop test versions have been developed over the years according to specific research needs. Given the countless amount of Stroop test versions and the great variance between all of them, we propose a standardized digital freeware version of the Stroop test, eStroop, able to measure accurately the processes underlying the Stroop effect with a trial-by-trial millisecond precision. We administered to 310 participants four types of stimuli in random order (in four different colours): 1. Discs; 2. Number words ("Three", "Seven") 3. Colour names congruent with the colour they are presented in (word "Red" in red colour); 4. Colour names incongruent with the colour they are presented in (word "Red" in green). The task is to name aloud the colour of each stimulus as fast as possible. Results show different types of interference according to the type of stimuli confirming the existence of different processes underlying the Stroop effect.

PS4.26. IMPACT OF MEMORY SET PRESENTATION ON THE ORDINAL DISTANCE EFFECT IN WORKING MEMORY

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Working memory refers to our ability to actively maintain and process a limited amount of information (items and their order) during a brief period of time. One behavioural signature of order processing is the ordinal distance effect: when participants have to indicate whether two probes are presented in the same order as in a memorised sequence, they are slower when the probes are at close than at distant positions. In previous studies, items of the memory set were simultaneously presented, such that ordinal and physical distance were confounded. To determine whether ordinal distance can affect performance on its own, we compared the ordinal distance effect when items of the memory set are presented simultaneously and when the items are sequentially presented (no confound of physical distance). We observed a distance effect with both presentations, which was even stronger with the sequential layout.

PS4.27. CURRENT AND LONGITUDINAL PREDICTORS OF SYMBOLIC AND NONSYMBOLIC NUMBER ORDERING

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While increasing evidence links individual differences in processing of numerical order to arithmetic performance, the mechanisms that support the development of symbolic and nonsymbolic ordinal processing are still unclear. We investigated the contributions of magnitude comparison, counting, visuospatial working memory, inhibition and processing speed to growth in ordering skills from Grades 1-2 in a sample of 170 children. Symbolic and nonsymbolic magnitude comparison and visuospatial working memory were significant predictors of initial achievement as well as growth in symbolic and nonsymbolic ordering. Counting, however, was only a significant predictor of initial symbolic ordering. These results imply that children who are more familiar with the counting sequence are at an advantage when identifying an ordered sequence of digits, but not dots. In sum, nonsymbolic ordering appears to be based on pairwise magnitude comparisons and visuospatial strategies, while symbolic ordering may additionally be supported by retrieval from the verbally rehearsed count-list.

PS4.28. MOTOR LEARNING IN MENTAL PRACTICE: IS IT EFFECTOR-INDEPENDENT?

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Mental practice (MP) refers to the repeated use of motor imagery to improve performance. We investigated whether motor learning is less effector-dependent in MP than in physical practice (PP). A visual serial reaction time intermanual transfer task was used. Participants performed 6 sessions. Each session started with a test performed once with each hand, which consisted of a practiced sequence, a mirrored sequence, and two different sequences. After the test, one of the sequences was practiced 60 times, either mentally or physically, with one hand. From the third session onwards, RTs of the unpracticed hand were faster in the practiced sequence than in the other sequences. The practice groups did not significantly differ between each other. Hence, we observed intermanual transfer of implicit sequence learning in both, MP and PP. Possibly, effector-independent representations are equally acquired in MP and PP.

PS4.29. ONLINE AND OFFLINE TESTS OF STATISTICAL LEARNING: COMPARING MEASURES FROM 2AFC, SICR AND SYLLABLE DETECTIONS TASKS

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Testing young adults, we aimed to examine the sensitivity of three different measures of statistical learning in a word segmentation paradigm and to test relationships between them: online measures from a syllable detection task, offline implicit measures from a SICR (statistically-induced chunking recall task, Isbilen et al., 2017) and offline explicit measures from a 2AFC task. We found significant learning effects in all subtests. The size of the learning effect in the syllable detection task significantly correlated with subjects' performance in the 2AFC task. No significant relationships were found between SICR performance and either the 2AFC task or online measures. Syllable detection proved to be a sensitive non-metacognitive measure of SL which, unlike SICR is also related to metacognitive measures. Further explorations of different measures of SL should help us find better ways of testing different populations and variation in SL abilities.

PS4.30. AS TIME GOES BY: SPACE-TIME COMPATIBILITY EFFECTS IN WORD RECOGNITION

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How do people process words that refer to time? It has been argued that time activates spatial representations organized on a left-to-right axis, a mental timeline, where past events would be to the left and future events to the right. Here, we investigated whether time words are represented from left to right and thus interfere with hand movements that go in the opposite direction. To test this hypothesis, we conducted a lexical decision task on conjugated (past/future) verbs/nonverbs. To make their decision, participants had to move a pen to the right or to the left of a trackpad. In the congruent condition, grammatical time and hand movements went in the same direction (e.g., past tense/words to the left). In the incongruent condition, grammatical time and hand movements went in the opposite direction. We hypothesized that time-space incongruency should slow down reaction times, increase error rates and alter response trajectories.

PS4.31. THE ADAPTIVITY OF COGNITIVE CONTROL ACCORDING TO THE METACONTROL STATE MODEL

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According to the Metacognitive State Model, cognitive control depends on the interplay between persistence and flexibility, and can thus be captured by a single metacognitive dimension. We studied inter- and intraindividual differences in metacognitive balance in various tasks drawing on both persistence and flexibility. In particular, we asked to what degree metacognitive balance would reflect a trait-like metacognitive bias, resulting in individual biases that generalize over tasks, or whether individuals would tailor their metacognitive state to each task, requiring intraindividual adaptivity of the metacognitive state bias. Our findings suggest that individuals indeed show a tradeoff between persistence and flexibility but no generalizable metacognitive bias over tasks. Moreover, generalizability of performance indicates that individuals differ in the extent to which they adapt their metacognitive bias from task to task. We suggest that adaptivity (i.e., task-/context-specificity) of metacognitive biases should be taken into account in future cognitive control studies.

PS4.32. MOVE YOUR BODY AND LEARN MATH! THE EFFECT OF MOTOR INVOLVEMENT IN COMPUTER COGNITIVE TRAINING ON BASIC MATHEMATICAL ABILITIES IN CASE OF PRIMARY SCHOOL CHILDREN

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Studies confirm the benefits of computer cognitive and cognitive-motor training on the mathematical abilities. We examined the effect of such types of training on number comparison and mental number line processing with the use of computer game "Kalkulilo". Eighty-eight participants were divided into 3 groups: the group training with "Kalkulilo" on laptop, group training with "Kalkulilo" and Kinect sensor and group of passive controls. Training took 5h and was divided into 10 sessions. The results indicate that training improves the accuracy of number line estimation and reaction time in non-symbolic number comparison in trained groups. This effect is particularly pronounced in the cognitive-motor training group, which suggests that this type of training is more effective than standard one (with computer). Therefore, we conclude that "Kalkulilo" may be a valuable tool not only in math education but also in overcoming the deficits observed in dyscalculia, especially when used with Kinect sensor.

PS4.33. RELIGIOUS PRACTICE AND ANXIOUS RESPONSE TO ERROR. A COMPARISON BETWEEN CATHOLICS AND SECULARS

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Recent cross-cultural studies have focused on the impact of religion on cognition, emotion, and motivation, based on the notion that religious practices are much more explicitly defined than cultural practices. The present study investigates the effect of Catholic practice, which is characterized by the possibility of remedying error (sin) by repenting. We tested Italian Catholics and Seculars using the Stroop task. Five out of ten blocks were preceded by a prime-sentence related to the specific group-attitude. We analyzed errors, response times and event-related potentials, specifically the error-related negativity (ERN), a component that is thought to index anxious reactions to self-generated errors. While no differences were found on behavioral data between the two groups, ERPs analyses showed that ERN amplitude was larger for Seculars than

for Catholics, but only for neutral blocks. With religious-catholic primes, Catholics' defensive responses to errors significantly increased, thus sentence-prime manipulations modulated the neural signal of distress.

PS4.34. EFFECTS OF DISTRACTOR AND TARGET DURATION ON THE TIME COURSE OF THE ACCESSORY SIMON EFFECT
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Lateralized responses to central targets are facilitated when a distractor is presented ipsilaterally as compared with contralaterally to the response. This so-called accessory Simon effect decreases and reverses when the time between distractor and target increases, indicating that irrelevant spatial codes are inhibited. The present study investigated the impact of distractor and target duration on the time course of the accessory Simon effect. A lateralized distractor either occurred prior to or simultaneously with the target. Distractor duration (brief vs. persistent until response) was varied groupwise. Targets were presented briefly (Experiment 1) or persisted until the response (Experiment 2). Solely in Experiment 1, the time course of the Simon effect depended on distractor duration, with a reversed effect only with brief distractors. This suggests that the time course of the Simon effect is affected by the interplay between distractor and target duration and that inhibition operates on irrelevant spatial codes.

PS4.35. EFFECTS OF ORTHOGRAPHIC NEIGHBOURHOOD AND WORD IMAGEABILITY IN VISUAL WORD RECOGNITION

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The aim of this study was to investigate whether orthographic neighbourhood and word imageability interact in visual word recognition. Prior studies on written word identification have found evidence for an inhibitory effect of high-frequency orthographic neighbours (Grainger et al., 1989), while others have shown a facilitatory effect of semantically rich words, such as high imageable words (Yap et al., 2012). Yet, to our knowledge, the combined influence of these two factors has not been investigated. In our study, French words had either few neighbours, or many higher-frequency neighbours. Each subset was divided according to word imageability (low, high). The words were presented in two different word identification tasks (lexical-decision and progressive-demasking). In both tasks, results indicated an inhibitory effect of orthographic

neighbourhood and a facilitatory effect of word imageability, but no interaction. These data provide support for an additive influence of orthographic neighbourhood and word imageability in visual word recognition.

PS4.36. DIFFUSION OF RESPONSIBILITY AND THE OUTCOMES ON SENSE OF AGENCY

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Sense of agency (SoA) refers to a feeling of control over one's actions and the outcomes of those actions. The value of the outcomes is an important factor of SoA, which is crucial for social interactions and may be linked to a person's experience of responsibility. When free will is restricted, SoA may decrease (i.e., diffusion of responsibility); however, whether outcome effects are modified by DoR remains unclear. This study used an intentional binding task to estimate the time interval between actions and outcomes to determine the relationship between DoR and the value of the obtained outcomes. Under free-choice or forced-choice conditions, participants were required to press one of several keys. After several hundred milliseconds of pressing the key, participants were given either moderately or severely negative outcomes and required estimate the time interval. The results of the investigation suggest that DoR may decrease the value of the outcomes.

PS4.37. THE ROLE OF CONTINUOUS MAGNITUDES IN NUMEROSITY PERCEPTION: COMPUTATIONAL INVESTIGATIONS WITH DEEP LEARNING

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Visual number sense can emerge as a high-order statistical feature from deep unsupervised learning. Here we present a series of simulations based on a recently proposed stimulus space that allows to carefully measure the contribution of non-numerical magnitudes (e.g., cumulative area, total perimeter, item size, convex hull, density) in numerosity comparison tasks. Our computational model accurately simulates the psychophysics of numerosity perception: though non-numerical features had a non-negligible impact on the responses of both human observers and deep networks, discrimination choice was mostly driven by numerosity information. Moreover, representational similarity analysis highlighted that numerosity was spontaneously encoded as a salient dimension in the representational space of the deep neural networks. Our findings thus

demonstrate that number is a major, salient property of our visual environment, at the same time pointing to the importance of non-numerical features in biasing numerosity perception.

PS4.38. FACE ADAPTATION EFFECTS ON NON-CONFIGURAL INFORMATION

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Previously inspected faces can affect the perception of faces seen subsequently. The underlying mechanisms of these face adaptation effects (FAEs) have been considered to be based on sensory adaptation processes. However, by employing famous faces, recent studies were able to demonstrate that FAEs are very reliable and robust over long periods of time. This suggests a high level processing and an adaptation on a rather representational memory basis. Although research on FAEs seems to be well-advanced, our knowledge is still quite limited in terms of which qualities of a face can be adapted, as most studies have focused on configural information (i.e., mostly 2nd-order relations). By employing color brightness and saturation alterations, we investigated whether non-configural face information also play a significant role in the processing and storage of faces. Our results provide evidence for non-configural color adaptation effects which seem to be unique within the context of faces.

PS4.39. DOES TIME-BASED EXPECTANCY FOR A TASK SWITCH INCREASE VOLUNTARY SWITCH RATE?

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Time-based expectancy has an impact on performance in a task-switching scenario. For instance, participants respond faster if tasks or task transitions are predicted by a pre-target interval. So far, it is unclear whether time-based expectancies will also impact participants' free choice in voluntary task switching. This question is of major importance because of the known tendency to avoid the costs associated with switching. In the present study we used two pre-target intervals (short and long) which each were combined either with a task repetition or with a task switch. Forced-choice trials allowed participants to learn these fixed interval-transition combinations. Intermixed free-choice trials were randomly preceded by either a long of a short pre-target interval; participants could freely decide

which task to perform. We found that voluntary task transitions were influenced by time-based expectancy effects, especially for participants for whom task switches were combined with the long pre-target intervals.

PS4.40. ACTION-NEGATED SENTENCES MODULATE MOTOR SYSTEM ACTIVATION: A TMS STUDY.

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Theories of embodied language meaning suggest that understanding action words and sentences activate motor processes. The negation applied to an action context seems to modulate the motor activation in the brain, expressed by the reduction of motor excitability. A recent non-invasive brain stimulation study investigates this topic using manual verbs and abstract verbs. They found corticospinal excitability modulation for affirmative manual verbs, but not for negate manual verb and abstract verbs (Papeo, Hochmann, & Battelli, 2016). In the present study we applied single-pulse Transcranial Magnetic Stimulation (sp-TMS), to extend the negation effect to more complex sentences. We found that the motor evoked potential, induced by sp-TMS over left primary motor cortex were smaller for action-negative sentences compared to action-positive and attentional sentences. Confirming previous findings, our results show that negation plays a specific role in sentences representation and suggest that even syntactic feature of language is embodied.

PS4.41. IN SEARCH OF GOOD BEHAVIOURAL MEASURES OF VISUAL IMAGERY.

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Resolving the role of visual mental imagery in cognition is limited by lack of good behavioural measures of how imagery varies across individuals. We discuss weaknesses with currently proposed measures. We then describe an attempt to assess one behavioural paradigm, adapted from work by Kosslyn and colleagues, which initially seemed a promising alternative measure of high resolution visual imagery. Participants imagined letters superimposed over displayed patterns and judged the relative overlap of their image with different parts of the pattern. Contrary to expectations, large multiple-site samples found that better performance in this task was predicted by self-report and behavioural measures of spatial imagery, and that stronger self-reported visual imagery was detrimental to

performance. We discuss why it is so difficult to find good measures of visual rather than spatial imagery, and various reasons why visual imagery might have been detrimental. Initial data on more promising behavioural measures is then presented.

PS4.42. IMPACT OF EMOTIONAL AND SMOKING CUE-RELATED PROCESSING ON INHIBITORY CONTROL

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Inhibition deficit and drug-related cue reactivity are particularly involved in the maintenance and relapse of addictive behaviors. Accordingly, reduced inhibitory control has regularly been reported for smokers compared to non-smokers, but few studies have yet investigated the impact of smoking cues exposure on inhibitory control. We conducted an ERP experiment in which current smokers and never-smokers performed a modified Go/NoGo task in which a picture (smoking cues, appetitive or neutral) was presented 250 ms before the Go/NoGo cue. The inclusion of appetitive pictures aimed at distinguishing between drug-specific and global emotional processing interferences. We hypothesized that smoking cues exposure would accentuate the general inhibitory deficit in smokers. Preliminary analysis revealed strong emotional (appetitive and smoking-related cues) modulations on early (pre-Go/NoGo cue) and late (post-Go/NoGo cue) components. Results suggest that not only smoking cues but more general emotional processing interfere with inhibitory control, arguing for a global emotional deregulation in addiction.

PS4.43. CATEGORICAL PERCEPTION OF BLENDED FACIAL EXPRESSIONS IS PROMOTED BY EMOTION LABELING

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Categorical perception (CP) refers to continuous similar things are perceived as different categories based on apparent boundary. According to the psychological constructionist view, people show CP for emotional faces because they have labels like "anger", "sadness", and "fear" which provide conceptual knowledge of emotions to structural information of facial movements (Barrett, 2006a, 2006b). However, it is difficult to ascertain the contribution of emotion labels in people's accustomed perception of emotional faces. In the present experiment, we examined CP effects between prototypical facial expressions and blended facial expressions (e.g., 'fear' – 'fear + disgust') with or without emotion labels using a XAB discrimination task. Compared to the without label condition, CP only occurred to

participants who were provided emotion labels 'fearful' and 'horrible' for prototypical and blended facial expressions. The current results support the claim of psychological constructionists that language plays an important role in the process of constructing emotion.

PS4.44. HIPPOCAMPAL SUBFIELDS' VOLUME CORRELATES WITH PHYSICAL ACTIVITY CONTEXT

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The relationship between physical activity (PA) performed in different habitual contexts and the hippocampal subfields is still not well understood. In this study, we performed Surface-Based Morphometry on Magnetic Resonance Imaging data collected from 30 young healthy participants to examine how PA performed in three different situations relate to the volume of the hippocampal subfields. These situations were: work (WI), sports (SI) and leisure-time (LI). We independently analyzed the data for each substructure volume and performed a multiple regression analysis. Our results showed that SI had a negative relationship with CA2/3 volume, and WI was a positive predictor of CA4 and DG volumes. LI was not related to any substructure's volume. These contrasting effects may suggest different impacts of routine and intensity of PA on the volume of HF substructures differently, which could be of importance in designing PA programs for therapeutic interventions.

PS4.45. POSTURAL INTERFERENCE EFFECT ON THE MEMORY OF ACTION-RELATED LANGUAGE: AN ERP STUDY

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In two experiments, the role of motor information in language and memory was investigated combining behavioural and neurophysiological methods. Participants had to learn phrases that associate a manipulable object to a manual action verb or an attentional verb, while keeping their hands in front of them or behind the back. Their memory of objects was assessed in both experiments, and the EEG activity related to this task was additionally recorded in experiment 2, both at learning and recall. Over these two experiments, results showed an interaction between posture and verb type, at both the behavioral and the neurophysiological levels. The results replicated and extended what Dutriaux and Gyselinck (2016) called the PI

effect, that is, a specific interference of the behind posture with the memory of action related material, which advocate for the causal involvement of sensorimotor system in the memory and the conceptual processing of action language.

PS4.46. FACILITATORY EFFECT OF WERNICKE'S AREA TDCS ON THE ACQUISITION OF NOVEL SEMANTICS

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Existing evidence suggests that tDCS over Wernicke's area can positively influence semantic processing of linguistic input. Here, we test whether it can similarly affect acquisition of novel semantics. Three groups of participants received anodal, cathodal or sham tDCS before contextual learning of novel concrete and abstract concepts. Learning outcomes were assessed using free-form definition and semantic matching tasks immediately after the training and following an overnight sleep. Semantic matching task indicated higher accuracy of the anodal (as opposed to sham) group for concrete semantics on Day 1 and for both semantic types on Day 2. Free-form definition revealed better performance of the cathodal than sham group in defining abstract semantics on Day 2. The overall advantage of both tDCS groups over sham stimulation suggests that Wernicke's area tDCS can facilitate acquisition and consolidation of novel semantics, although the exact effects depend on the semantic type, stimulation polarity and assessment task. Supported by RF Government grant contract No.14.W03.31.0010.

PS4.47. VARIABILITY AND ORTHOGRAPHY IN LEARNING NEW WORDS

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This study investigates the influence of two factors on second language novel word learning: variability in the spoken input and availability of orthographic information. Forty French speakers learned to associate 20 pictures of novel objects to 20 English pseudowords, recorded by native speakers of American English. The pseudowords were monosyllabic and contained the orthographic vowels <o> or <i> (losp, mib), whose grapheme-to-phoneme correspondences differ between French and English. The pseudowords were presented either with auditory input, or with auditory and orthographic input. Half the

participants heard the words produced by six different talkers, half by a single talker. Results show pervasive effects of orthography but little evidence for an effect of variability. Words learned with orthographic input were better remembered and accessed faster in production and perception tasks. However, acoustic analyses showed that the vowels of words learned with the orthographic input were produced with pronunciations that were more French-like.

PS4.48. PERCEPTUAL AND ATTENTIONAL IMPAIRED MECHANISMS IN POSTERIOR CORTICAL ATROPHY

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Simultanagnosia is very frequent in Posterior Cortical Atrophy (PCA). We explored the phenomenon with two main hypotheses: the global processing deficit is due to the impairment of low-spatial frequency processing and/or focal attention. PCA patients and controls were administered the Navon hierarchical letters, unbiased (black letters/white background) and parvo-cellular biased (equiluminant red letters/green background). A cued T-detection task where the sizes of the square-cues varied, was used to explore focal attention. PCA patients showed only a partial benefit from the parvocellular-biased condition. Controls but not patients responded faster to targets preceded by small cues as compared to large or no cues. Data indicate the presence of an anomalous, frozen mechanism of focal attention that prevents patients from adapting the attentional window to stimulus features. Simultanagnosia in PCA can be conceptualized as the complex result of different mechanisms: the lack of flexibility of the attentional focus and magnocellular perceptual deficits.

PS4.49. WHY IS PROCRASTINATION PERSISTENT? MONETARY PROBABILISTIC REVERSAL LEARNING TASK REVEALS DEFICITS IN LEARNING ON ERRORS IN PROCRASTINATORS, ESPECIALLY IF THE ERRORS ARE PUNISHED

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Procrastination, a behavior in which people irrationally delay certain tasks, is estimated to affect 15-20% of the total population, and leads to lower performance and quality of life. Our previous Go/No-go studies revealed behavioral

and neuronal deficits in error processing in procrastinators. Here we address the question if procrastination is related to impaired learning on errors. We invited low (LP) and high (HP) procrastinating students to participate in the monetary probabilistic reversal learning task consisting of two conditions: REW (reward or no reward) and PUN (no punishment or punishment). Results of the Rescorla-Wagner model applied to the collected data revealed that HP had significantly lower learning rate and exploration tendency than LP in the PUN condition. These results suggest that procrastination can root from impaired learning on errors and punishments – both lower learning rate and exploration tendency can hinder correction of faulty behaviors and add to persistence of procrastination.

PS4.50. SEX DIFFERENCES IN SPATIAL WORKING AND SPATIAL RECOGNITION MEMORY IN ADOLESCENCE

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The aim of our study was to investigate sex differences in spatial working and spatial recognition memory. The study involved 409 adolescents aged 10 to 17 (mean age= 12.8, SD= 1.84; 233 girls). We used "Spatial recognition memory" (SRM) and "Spatial working memory" (SWM) tests from the battery of neuropsychological tests CANTAB eclipse. We used robust frequentist approach together with Bayesian statistics (Lakens, 2015) to establish possible group differences. We also used graphical methods of comparison with shift function (Rousseelet et al., 2017) to investigate the details of data distribution. We measured the number of the correct answers and their mean latency. We find gender differences for SWM but not SRM performance characteristics. The results will be discussed in the line with Gender Similarities hypothesis (GSH; Hyde, 2005) that suggests that the reasons of gender differences lie predominantly in environmental factors.

PS4.51. IS IT POSSIBLE TO REPLICATE ERP STUDIES BASED ON JOURNAL ARTICLES? A SYSTEMATIC REVIEW ON REPORTING CLARITY, PRIORITIES AND OMISSIONS IN PAPERS ON THE N400 AFTER PICTURE STIMULI

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We systematically reviewed methodology reporting of 132 papers on experiments with N400 after picture stimuli and adult participants without psychopathology record. The reports were the clearest about sample size (99%), number of trials (98%), N400 window (99%) and measure (94%), artifacts handling approach (rejection/correction, 95%), and the main statistical analysis (92%). They were less clear about analysed trials count (41% not reported), impedance (28% n.r.), analysis reference (3% inconclusive, 8% average reference without information on sites), reasons for choosing analysis window (36% n.r.) or montage (39% n.r.), baseline (23% n.r.) and epoch duration (17% n.r.), whether epoch overlapped with response or the next stimulus (22% n.r.), and artifacts detection method (27% n.r.). While 2% papers didn't report filtering, about 20% didn't report online filters, 70% didn't report whether cut-offs were half-amplitude or half-power, and 80% didn't provide any roll-off information. In 54% cases, it was not possible to make an assumption about the order of analysis steps.

PS4.52. COGNITIVE CONTROL IN HIGHLY MATH-ANXIOUS INDIVIDUALS

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According to the dual mechanism of control theory, cognitive control can be exerted either proactively or reactively. Proactive control seems to be reduced by anxiety. We aimed to investigate whether individuals with high math-anxiety (HMA) also show this control deficit, by using a Stroop task. Strong Stroop interference effects are classically interpreted as showing an informational conflict, but recent studies (Kalanthoff et al, 2018) have stressed the relevance of the reverse facilitation effect as an indicator of task conflict. Twenty HMA and 20 low math-anxious (LMA) participants named the ink color of congruent, incongruent or neutral (XXXX) stimuli. An interference of the incongruent stimuli was found for all participants, although it was stronger in HMAs. Facilitation effects were only obtained in the LMA group. Last, HMA participants were slower than LMAs in the congruent and incongruent conditions. Altogether, our data support the idea that math anxiety affects proactive control.

PS4.53. COGNITIVE DISTORTIONS ON CHILD OR ADULT SEXUAL AGGRESSION EXPLAINED BY THE SADISTIC PERSONALITY

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Cognitive distortions are misinterpretations of the world, as well as malevolent justifications following specific behaviors. They are present on an everyday basis or after malevolent offence. These cognitive distortions have been linked to prosocial personality traits of the Big 5. However, given that these distortions are malevolent, our study proposes to examine their relationships with malevolent personality traits, known as the dark tetrad (Machiavellianism, psychopathy, narcissism and sadism). Participants completed questionnaires on justifications about sexual assault of adult women and children (Bumby Rape Scale; Bumby Molest Scale), and then on the dark triad and sadism personality trait (DDS; SSIS). Our results show that justifications related to sexual assault of adult women or children are predicted by sadism. Sadism is the most extreme of these personality traits and has already been associated with malevolent sexual behavior. Interpretations are proposed based on the characteristics of each dark trait and their behavioral implications.

PS4.54. A SOLUTION STRATEGY INTERVENTION IMPROVES STUDENTS' PERFORMANCE IN PROBLEM SOLVING IN GEOMETRY

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Difficulties in problem solving may stem from students' inefficient inhibitory control mechanisms or solution strategies. We focus on a well-known difficulty in comparison of perimeters of two geometrical shapes. Incongruent trials, when one shape has a larger area but not a larger perimeter, yields lower accuracy and longer RT than congruent trials when one shape has a larger area and perimeter. We showed that a warning intervention that activated inhibitory control mechanisms improved sixth graders' performance. Here we studied whether demonstrating an appropriate decision-making solution strategy would also improve sixth graders' performance. Seventy-eight students were randomly divided into strategy and control groups. Findings indicated that the strategy intervention improved students' performance much like the warning intervention, suggesting that inhibitory control mechanisms and solution strategies are both important for problem-solving. Our study points to the possibility of improving students'

problem-solving abilities by simple interventions as described here.

PS4.55. PERCEIVED DURATION INCREASES NOT ONLY WITH ACTUAL BUT ALSO WITH IMPLICIT DURATION.

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Humans estimate time with an astonishing precision. For example, an increase of a standard duration in the range of milliseconds can be detected with the method of duration reproduction. However, studies on duration reproduction have shown a modulation of perceived duration by diverse stimulus properties such as stimulus size. Recent findings have furthermore suggested that not only physical, but also implicit stimulus properties (i.e., imagined stimulus size) affect perceived duration. Against this background, we conducted a study in which we manipulated implicit duration by the use of phrases with different speed along a fixed spatial extension (e.g. 'running to the supermarket' vs. 'roaming to the supermarket'). Participants were asked to reproduce the phrase's display duration: Although the content of the phrase was task-irrelevant for reproducing this duration, the results nevertheless revealed a reliable increase in reproduced duration when the phrase included slow compared to fast motion verbs.

PS4.56. COMPLEXITY OF THE INTERRUPTIONS: EVIDENCE SUPPORTING A NON-INTERRUPTIONS-BASED THEORY

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The complexity is one of the most studied characteristics of interruptions and there is a widespread consensus that complex interrupting tasks create longer resumption times (RL). One explanation come from task switching theories, suggesting that a longer time is needed to inhibit complex interrupting task-sets. We thus tried to assess this hypothesis by manipulating the time before the resumption of the primary task (TBR). We carried out two experiments in which a primary email searching task was randomly interrupted by an updating task (simple or complex). TBR lasted either 0, 750, 1500 or 3000 ms. Results showed that without TBR, RL are longer after complex interruptions but progressively decrease as TBR increases. At 1500 ms, the complexity effect disappears and RL are the shortest, and then increase until 3000 ms. Our results support the task switching explanation and does not fit with others that also could explain the complexity effect.

PS4.57. FINDING THE SELF, WHEREVER IT IS: AN EMPIRICAL INVESTIGATION OF THE LOCATION OF THE SELF

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A rich body of research suggests that people have a homogenous sense where their 'Self' is located: near the head and upper torso. We confirmed this presumed location of the self – which was based on subjective ratings – with an objective measure by using a paradigm, in which an integration of formerly neutral stimuli into the self-concept can be measured. A first study revealed that integration only occurred when the to-be-associated stimuli were presented close to the head and upper torso. In a second study, the self and others were associated with avatars and, again, integration was significantly reduced when stimuli were presented further away from the avatars' head/upper torso. Taken together, the results suggest that only those stimuli are integrated into the self, which are perceived as close to a focal point in the body, and that this 'location of the self' seems to be flexible.

PS4.58. THE COGNATE EFFECT IN NOISE

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Bilinguals process cognates (translation equivalents sharing meaning and form; e.g., 'elephant' and 'elefante' in English and Spanish) faster and more accurately than non-cognates (translation equivalents sharing only meaning; e.g., 'book' and 'libro'), which is called the 'cognate facilitation effect'. This effect is explained by a constant language co-activation in the bilingual's brain; simultaneous activation of the translation equivalent (in the unattended language) leads to higher activation levels for cognates because of form similarity. We explored whether the effects of cross linguistic co-activation are affected under adverse conditions (e.g., noisy signal). In a 2x2 design (cognates/non-cognates; clear/noise), Spanish-English late proficient bilinguals performed a visual lexical decision task. We measured the cognate effect in clear and in noisy signal and found a significant reduction of the cognate effect in noise. This suggests that challenging listening conditions may engage language control processes that reduce the co-activation of the unattended language during word recognition.

PS4.59. FAST BUT NOT SLOW RESPONSES CAUSE INTERFERENCE IN CONFLICTING STIMULI: EVIDENCE FOR COGNITIVE CONTROL AND THE BOTTLENECK

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Navon stimuli are a classical example of interference effects. In such experiments, a big letter is made out of a collection of smaller letters. Responses are usually faster when the letters are congruent and slower if the letters are incongruent, i.e. an interference effect. I aimed to find out if those interference effects occur automatically, by rendering the Navon stimuli task-irrelevant and asking participants to respond to the luminance of the letters. Interference effects still occurred, but only in 'fast' responses. The results are explained to the lens of cognitive control, assuming automatic processing for 'fast' responses and controlled processing for 'slow' responses. The lack of interference for 'slow' (controlled) responses could reflect aspects of cognitive control. Alternatively, a bottleneck occurring for 'fast' responses can be assumed. It is possible that for 'fast' responses, letter identification and luminance detection competed for output, leading to a bottleneck that caused interference.

PS4.60. VISUAL WORKING MEMORY IMPROVES DURING STANDING AND EXERCISE: AN EEG STUDY

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While recent studies have reported effects of exercise on cognitive performance, only a few have monitored exercise-concurrent cognitive processes via EEG. Here we combined mental chronometry with two specific EEG waves during a retro-cue paradigm, to investigate what influence aerobic exercise and upright posture might have on the temporal dynamics of a concurrent visual working memory (VWM) task. Participants performed the task during both rest (sitting vs. standing) and acute aerobic exercise (cycling vs. walking), using a stationary bicycle and a treadmill, respectively. We found reaction times being speeded during exercise and upright posture, which was mirrored by LRP onsets. In addition, we observed CDA waves – indicating the access of WM representations – being delayed for upright as compared to seated conditions, with no influence of exercise. Together, our results demonstrate that, within an optimal range of cardiovascular load, acute aerobic exercise and upright body posture can significantly improve VWM performance.

PS4.61. ONLY UNBOUNDED NUMBER LINES INDEX NUMERICAL REPRESENTATION IN SCHOOL-AGED CHILDREN

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Number line tasks are often used to assess children's numerical representation. However, only unbounded task versions might provide an appropriate measure. We tested 69 children aged 7–12 years on unbounded and bounded tasks. Bounded and unbounded performances in terms of percent absolute error were unrelated. Moreover, only bounded performances correlated with arithmetic skills. Median estimates in the bounded condition were better described by a variety of cyclic power models than the mixed log-linear model, suggesting proportional reasoning, where the number of reference points increased with age. In the unbounded condition, a single-scallop power model yielded a better fit than the mixed log-linear model. This indicates a direct estimation strategy without, however, substantiating the log-to-linear shift in numerical representation in the present population. Our results confirm that the unbounded task is a more appropriate measure of numerical representation, indexing direct estimation skills independent of arithmetic performances.

PS4.62. AN OFFER YOU CAN REFUSE - HOW SENSITIVE IS THE MFN TO NORM REPRESENTATION?

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Medial frontal negativity (MFN) is an event-related potential thought to originate in the anterior cingulate cortex. It is evoked by outcomes being worse than expected, such as violations of the fairness social norm. To examine the link between MFN and norm violation, we designed an EEG experiment with participants acting as representatives in an Ultimatum Game. Participants responded either as themselves, or as representatives of two charities. Of these, a norm-compatible charity conformed to the participant's values, while the norm-incompatible charity contrasted to them. The behavioural results showed that norm-incompatible representation reversed behaviour, with almost all fair offers being declined. The MFN, however, was unaffected by the norm representation and generous offers evoked as much MFN as unfair offers. Thus, the MFN is not nearly as sensitive to higher-order social-emotional processes as commonly assumed. Instead, the perceived inequality that drives the MFN is likely due to a rational, probabilistic process.

PS4.63. DEVELOPMENT OF SYNAESTHETIC CONSISTENCY: REPEATED ENGAGEMENT WITH GRAPHEMES AND COLOURS LEADS TO CONSISTENT ASSOCIATIONS

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Synaesthetic consistency is the hallmark of synaesthesia and plays an important role in the definition and validation of synaesthesia. It has been hypothesised that initially unspecified grapheme-colour associations become consistent due to consolidation processes. Thus, we investigated in non-synaesthetes whether repeatedly engaging with grapheme-colour associations mimics the developmental trajectory of synaesthetic consistency in genuine grapheme-colour synaesthesia. This was indeed observed for two experimental groups, irrespective of whether they were instructed to memorize the chosen associations, but not for a passive control group. After the training, associations of the experimental groups resembled those frequently found in genuine synaesthesia. Furthermore, the acquisition of consistent grapheme-colour associations resulted in a transfer of benefits to performance in recognition memory for abstract stimuli, as also found in genuine synaesthesia. Our results support the hypothesis that consistent synaesthetic associations are based on consolidation processes due to repeated engagement with graphemes and colours.

PS4.64. COMPARING MASSED VS. DISTRIBUTED LEARNING IN A MIXED MODE SETTING

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Ongoing digital transformations facilitate online courses and distance learning. However, almost nothing is known about factors contributing to study success in distance learning settings. Thus, the following study aims to investigate the role of learner's behavior (regularity of learning, time of day of learning, motivation) and learner's personality (intelligence, Big Five, anxiety, self-esteem, self-control) on study success (exam scores) in a mixed mode approach (combination of e-learning and face-to-face learning). We measured participants' (N = 60) learning time and learning motivation over 14 weeks (one term) with questionnaires for two courses at the Swiss Distance Learning University. Additionally, we collected the grades at the end of the courses, and number of exercises completed during the term. We expect an effect of learner's personality on exam scores to be mediated by learning behavior.

PS4.65. BOOSTING INHIBITION IN BINGE DRINKING: ELECTROPHYSIOLOGICAL IMPACT OF JOINT COGNITIVE TRAINING AND NEUROMODULATION

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Excessive alcohol consumption among young adults has been associated with deleterious cognitive and cerebral consequences. Developing effective rehabilitation programs to address these negative effects constitutes a priority. We tested the behavioural and electrophysiological impact of combined cognitive training and neuromodulation to improve inhibition abilities. Two groups of participants (20 binge drinkers and 20 non-binge drinkers) had to perform two sessions: each session was composed by¹ a training inhibition task while participants received left frontal tDCS or sham, followed by² an alcohol-related Go/No-Go task, while both behavioural and electrophysiological measures were recorded. No significant behavioural differences were observed. At the electrophysiological level, a specific effect on attention resource mobilization (indexed by the N2) was revealed, while later inhibition processes (indexed by the P3) were not affected in binge drinkers. Overall, the present findings indicate that integrated neurocognitive remediation approaches can efficiently improve the brain correlates of inhibitory processes.

PS4.66. HOW SUBTLE GESTURES CAN INFLUENCE DECISIONS: A MAGICIANS' FORCING TECHNIQUE USING NON-VERBAL PRIMES TO INFLUENCE YOUR CHOICE OF CARD

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Conjurers have developed powerful psychological techniques that allow them to covertly influence a spectator's choice – forcing –. To date, very few of these forcing techniques have been investigated scientifically. We present data from a forcing technique in which subtle gestures are used to covertly guide spectators to choose the desired card. Our first set of experiments shows that gestures and auditory primes effectively prime participants to think of the intended card (between 15 and 50% success rates), which is significantly more than would be expected by chance (1,92%). Our final set of experiments uses funnel debriefing and control groups to assess participants' awareness of the covert influences and the impact of each individual hand gestures. Our results show the ease by which people's decisions can be covertly manipulated and

further illustrate how subtle gestures can have surprising impact on wide range of behaviours and choices.

PS4.67. DOES VISUAL PERSPECTIVE TAKING INFLUENCE THE SNARC EFFECT?

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Visual perspective taking (VPT) can be broadly defined as the ability to “put yourself in someone else’s shoes”. More specifically this consists in computing the viewpoint of other individuals, an ability that several studies found to be spontaneous. The Spatial-Numerical Association of Response Codes (SNARC) effect consists in faster left (vs. right) hand responses to small (vs. large) numerosities, suggesting that numbers are represented along a left-to-right oriented mental number line. Since this phenomenon is clearly bound to participants’ spatial coordinates, our aim was to test whether a VPT manipulation could moderate the SNARC effect. Participants completed a magnitude classification task with visual dot patterns in two conditions. In one condition only dot patterns were displayed, while in the second one a picture of a person mirroring the participants’ perspective appeared together with the dots. VPT seemed not to influence the participants’ SNARC effect, which remained consistent through the conditions.

PS4.68. N’SYNC OR A’SYNC? THE ROLE OF TIMING WHEN ACQUIRING SPOKEN AND WRITTEN WORD FORMS IN A TONAL LANGUAGE

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Theories of reading propose that the quality of word form representations affects reading comprehension. One claim is that synchronous retrieval of orthographic and phonological representations leads to better performance than asynchronous retrieval. Based on this account, one may hypothesize that synchronous rather than asynchronous presentation of orthographic and phonological forms should be beneficial when establishing the mapping between both, as it should lead to tighter couplings. We tested this hypothesis in two multi-session experiments, where participants studied isolated words of a tonal language unknown to them, Chinese. During study, written (using Pinyin transcription) and spoken word forms were presented simultaneously or in asynchronous fashion (audio-first, written-first). In both experiments, we observed an advantage for asynchronous over synchronous

presentation at test, with audio-first presentation being most beneficial. These results suggest that the timing of written and spoken word forms has profound effects on the ease of learning a new tonal language.

PS4.69. "HE WAS...UHM...BALD": RETRIEVAL EFFORT PREDICTS EYEWITNESS ACCURACY

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Evaluating eyewitness testimonies has proven a difficult task. We investigated if incorrect memories are more effortful to retrieve than correct memories. Participants watched a simulated crime and were interviewed as eyewitnesses. We then analysed retrieval effort cues in witness responses. Results showed that incorrect memories included more “effort cues” than correct memories, and also partially mediated the relationship between confidence and accuracy.

PS4.70. DISSOCIATING INHIBITION FROM DIMENSION SWITCHING IN THE STROOP TASK : AN INSIGHT FROM A CONFLICT ADAPTATION PARADIGM OVER THE LIFESPAN

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Historically the word reading and the color font dimension were dissociated in the Stroop task. However, more specific dissociations are possible, such as the engagement and disengagement of the inhibition from one trial to another, and the switch from the word to the color dimension and vice-versa. In the present study a conflict adaptation Stroop paradigm including neutral trials was used, also aimed at assessing changes in inhibition and conflict adaptation over the lifespan. A 180 trials Stroop requiring verbal responses was proposed to 125 healthy participants aged from 10 to 80 years. The results suggest that the two dimensions can be dissociated in the Stroop and that neither of them nor the conflict adaptation effect evolve across the lifespan.

PS4.71. DOES THE DEGREE OF POSITIVITY OF AUTOBIOGRAPHICAL MEMORIES CAUSE A DIFFERENCE IN THE MOOD REPAIR EFFECT BETWEEN VOLUNTARY AND INVOLUNTARY RETRIEVAL IN DEPRESSED PEOPLE?

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It is well known that retrieval of positive autobiographical memories (PAMs) improves negative mood. This phenomenon is known as the mood repair effect. Although previous studies have shown that the mood repair effect on depressed people is different between voluntary and involuntary memory retrieval, which factors cause the difference remains unclear. We examined whether the degree of positivity of autobiographical memory is different between voluntary and involuntary retrieval in depressed people. After a negative mood induction, participants retrieved PAMs involuntarily or voluntarily and they assessed the emotional valence of the memories. No significant difference in emotional valence between voluntary and involuntary retrieval was found. Additionally, the degree of positivity did not mediate the difference in mood repair effect. These results imply that the degree of positivity of PAMs does not cause a difference in the mood repair effect between voluntary and involuntary memory retrieval in depressed people.

PS4.72. BILINGUALS' LANGUAGE USE AND RESPONSE INHIBITION: THE ADAPTIVE CONTROL HYPOTHESIS TEST.

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The Adaptive Control Hypothesis (ACH) offers an interesting insight into the origin of the BA: the effectiveness of bilinguals' executive functions (EF) depends on how they use languages (i.e. language mixing and switching). The study aimed to test the ACH, while focusing on the response inhibition mechanism. We ran a large-scale experiment and employed extensive battery of classic tasks against a group of 215 Polish-English bilinguals. We planned to use the latent-variable approach to examine the ACH in a purer measure of inhibition. However, the model had low explanatory power: although the tasks revealed satisfactory reliabilities, they scarcely correlated among each other. We did not find any evidence for the ACH neither in the SEM, nor in the regressions for single tasks. Together, our study calls into question a unity of response inhibition and makes a case for more accurate tools

when attempting to pinpoint relations between bilingualism and EF.

PS4.73. AGE EFFECT ON ATTENTION ORIENTATION TOWARDS EMOTIONAL SCENES DURING EMOTIONAL AND ACTION APPRAISALS

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Previous studies suggest that the attentional prevalence towards negative information in young adults tends to disappear in normal aging and, sometimes, to change towards a prevalence of the positive information, particularly in a low-arousal context. However, this age-related effect called the positivity effect may depend on task demands. The study investigated visual exploration of high and low arousal emotional scenes in young and older adults during a classical emotional task based on the self-emotional experience and a motivational task based on the tendency to action. A categorization task was also used as a control task. Preliminary results revealed a greater attention for negative stimuli relative to other ones in both age groups, regardless of arousal level and task demands. A more extensive exploration of emotional scenes was also observed for emotional and motivational tasks compared to categorization task and for emotional task compared to motivational task in both age groups.

PS4.74. COGNITIVE CONTROL OF EMOTIONAL DISTRACTION – VALENCE-SPECIFIC OR GENERAL?

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Emotional information captures attention due to privileged processing. As a consequence, performance in cognitive tasks declines (i.e. emotional disrupt, ED). For negative stimuli, ED is reduced when participants recruit cognitive control prior or subsequent to presentation of an emotional distractor. Following up on this, we asked whether control of ED is specific to negative valence (i.e. control interacts with emotional distractor valence and reduces ED from negative distractor stimuli only) or general (i.e. control shields against the distracting influence of emotion, irrespective of the valence of emotional distractor stimuli). To test this, we systematically manipulated the valence of emotional distractors (pictures) and assessed how control (instigated by the flanker task), interacts with ED. In two

Experiments, we found that control preceding an emotional event and control following an emotional event reduced ED. This control of ED was independent of valence, suggesting that cognitive control suppresses irrelevant emotional distraction in general.

PS4.75. COGNITIVE CONSISTENCY IN MATHEMATICAL LEARNING DIFFICULTIES

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Mathematical learning difficulties (MLD) are characterized by difficulties in the understanding and processing of numbers and quantities. Studies also relate MLD to attentional difficulties that might be general or specific to the arithmetic domain. MLD's difficulties have usually been investigated by analyzing accuracy or RT's. Little consideration has been given to measures of intra-subject variability (ISV), that provide information about the consistency and efficacy of individuals' cognitive system. The current study examines the consistency of arithmetic performance using ISV measures in adults with MLD and matched controls. Participants performed numerical and non-numerical tasks. Results show that the MLD group had higher ISV measures compared to controls in numerical tasks only. The results suggest that in addition to the numerical deficits, this population has difficulties recruiting attentional resources when performing arithmetic tasks, leading to inefficient and fluctuant performance. These findings broaden our understanding of MLD towards developing new interventional programs.

PS4.76. WATCH YOUR DOG! HOW OWNERSHIP MODERATES EC EFFECTS

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Evaluative conditioning (EC) is considered as a basic learning process that involves evaluative changes due to stimuli pairings. There has been a considerable debate over the nature of EC and the extent to which associative and propositional processes determine evaluative learning. This project contrasted the two approaches by manipulating the associative strength (through the frequency of stimuli repetitions) and relational knowledge about the stimuli (explicit instructions). We aimed to see whether changes in evaluation of previously neutral stimuli (CS) could be induced by both manipulations. Participants were shown pairs of pictures depicting neutral facial expressions (CSs) and either positive or negative dogs (USs) with different frequency and with different statements of dog ownership.

EC effect occurred only on those neutral faces that stood in the ownership relation with dogs. Moreover, the effect was moderated by frequency of CS-US exposure. Those results speak to the dual-process accounts of EC.

PS4.77. HOW UNIVERSAL IS MORPHOLOGICAL DECOMPOSITION? A MASKED-PRIMING STUDY ON SETSWANA PREFIXED WORDS

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In recent years, a series of morphological processing studies have provided evidence for automatic, pre-lexical, decomposition of morphologically complex words (Amenta & Crepaldi, 2012). However, these have tested a limited set of language families (mostly Indo-European) and linguistic phenomena (mostly suffixation). In the present study, we investigated morphological decomposition in a Bantu language (Setswana), which offers the unique opportunity to test inflectional prefixation. In a masked priming experiment with Setswana native speakers, we tested priming effects with prefixed inflected and derived primes. We aimed at replicating previous research with suffixed words, which, in native speakers, consistently showed equal priming effects for derivation and inflection (but reduced inflectional priming in non-native speakers; Silva & Clahsen, 2008). Our results show that, in native processing, inflectional priming is as large as derivational priming, even with prefixed words. This further supports the idea that early, pre-lexical, decomposition is a universal mechanism of morphological processing.

PS4.78. NEED FOR COGNITIVE CLOSURE, DISCOUNTING AND REWARDS: DOES IT ALWAYS COME DOWN TO RISK AVOIDANCE?

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As individuals high in the Need for Cognitive Closure (NFC) do not tolerate well unpredictability and ambiguity, they are generally thought to be risk-averse. In our study we challenged the assumption that risk avoidance in high NFC individuals is unequivocal, hypothesizing that it can be overridden by different task demands. Specifically, we expected that by introducing a "hot" decision task that is fast-paced and arousing, the tendency to avoid risks will be reduced when compared to a "cold", deliberate decision-making task. We also pondered upon the nature of this

relationship, assuming it can be explained by differences in delay discounting and reward sensitivity, as those variables both relate to decision-making and NFC. The obtained results partially support our hypotheses.

PS4.79. KNOWLEDGE ORGANISATION OF HIGH-LEVEL INFORMATION IN EXPERT MIND: PRIMING CHESS POSITIONS TO HIGHLIGHT VALUE OF A DISCRIMINATION NETWORK TO IDENTIFY CHESS CONFIGURATIONS

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Performances of experts' chess players are reliable to memorising abilities of game positions (Lane & Chang, 2018). The influence of organised knowledge by a discrimination network was successfully modelised to replicate chess players performances and competencies in various fields (CHREST; Gobet, 1993). However, it seems that there is a lack of experimental evidences to demonstrate that this model is well representing expert's functioning (Gobet, 2002). Based on priming researches that showed evidences for knowledge organisation (Corson, 2002; Postal, 2012), we proposed a chess adapted design. In this study, participants have to decide if chess positions showed a check situation. Target positions are preceded by primers facilitating or inhibiting access to experts' knowledge and modify their reaction time. We also proposed to differentiate automatic and directive leading performances process by varying priming duration. As in CHREST model, our results underline the efficiency of a discrimination network to perform in chess.

PS4.80. SELF-PERFORMANCE FALSE MEMORIES THROUGH IMAGINATION AND OBSERVATION

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To imagine someone performing an action (e.g.: sharpening a pencil) and/or watching someone performing it can both lead us to claim that we did it ourselves. Such memory distortions are called self-performance false memories (FM). But do imagination and observation together produce more self-performance FM than each one alone? To answer this question, we adapted a three-phase paradigm that allows testing imagination and observation separately and together. At first, 40 objects and action-state-ments were presented; half were read and performed, and half read and followed by unrelated hand-gestures. Subsequently, 30 actions were presented to four different groups of participants in a between-subjects manipulation: G1 observed twice, G2 imagined twice, G3 observed plus

imagined, G4 imagined plus observed. Two weeks later, a forced-choice source-memory test followed. We will discuss how imagination and observation can have complementary roles.

PS4.81. HOW DRIVING AUTOMATION IMPACTS DRIVER'S GAZE BEHAVIOURS?

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Humans interact with a variety of more and more sophisticated tools, in a wide range of everyday activities. Car-driving is an activity most individual living in modern societies engage in on a daily basis. As many other human activities, automation of car-driving is ever-increasing, following technological improvements. Here, we analyzed the impact of highly automated vehicles on drivers' visual information acquisition. To do so, we compared drivers' gaze behaviors under manual and highly automated driving. Under manual driving, the results confirmed previous observations: gazes at a far road region are meant to analyze future the road curvature; while gazes at a near road region are meant to maintain the vehicle within the lane limits. Under highly automated driving drivers' visual gaze behaviors were not extremely different from those observed under manual driving. However, less visual attention was devoted to the near road region as compared with manual driving.

PS4.82. FORGETTING THE FUTURE: FADING AFFECT BIAS AND CONTENT FEATURES OF EMOTIONAL FUTURE THINKING IN HIGHLY ANXIOUS INDIVIDUALS

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It is well-documented that the emotional intensity of autobiographical memory fades faster for negative than positive memories in healthy individuals, which presumably promotes psychological well-being. This so called fading affect bias extends to future events and influences memory content. Highly anxious individuals tend to have negatively biased views of the future. Therefore, several scientists have suggested that the fading affect bias may be reversed in this population. In the current study, we examined whether highly anxious individuals, relative to non-anxious individuals, show faster decay for positive than negative future memories. Using a novel paradigm (based on work by Szpunar et al., 2012), we studied recall for core event details and the emotional intensity of future simulations. Results will be presented and discussed at the conference.

PS4.83. GENDER ACTIVATION IN BARE NOUN PRODUCTION: BEHAVIORAL AND ERPS EVIDENCE

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The aim of this study was to explore the neural correlates of grammatical gender activation during bare noun production. Specifically, we examined the presence of gender effects. Spanish-speaking participants performed a picture-word interference task in which grammatical gender and semantic relation between stimuli were manipulated. Both behavioral and ERPs results clearly showed a gender congruency effect such as responses to gender congruent (and semantically related) pairs were more costly in comparison with gender incongruent (and semantically unrelated) pairs. In addition, the ERPs results showed a modulation related to both gender and semantic in 160-220 ms time window, such as greater amplitudes appeared with gender congruent and semantically related pairs. Our results suggest that the selection of grammatical gender reflects a competitive process preceding the access to morpho-phonological forms and that it occurs also when the noun has to be produced outside a sentential context.

PS4.84. DISTORTIONS IN REPRODUCING THE DURATIONS OF AUDITORY STIMULI: MUSIC VS. SPEECH

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Research on time perception suggests the presence of an internal clock that codes information about the passage of time. The aim of the present study was to examine whether the operation of this internal clock is influenced by the type of auditory stimuli presented. Participants carried out a reproduction task in which they first listened to a sound and then reproduced its duration by holding down the spacebar for the same time. Sounds contained either scrambled speech or music and could be of three different durations. Results showed that all sounds were underestimated. Notably, reproduced durations of speech stimuli were on average closer to their actual durations compared to the reproduced durations of music. Additionally, long audio clips were underestimated more than shorter clips and these differences were greater for speech than music stimuli. The implications of these findings for time perception are discussed.

PS4.85. THE LATERALIZATION OF SUPERIOR PARIETAL LOBULE IN POLISH SIGN LANGUAGE LEXICAL PROCESSING – INSIGHTS FROM FMRI AND TMS STUDIES

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Sign languages (SL) use space as the linguistic medium, which is reflected in the involvement of superior parietal lobule (SPL). Neuroimaging results remain inconclusive, reporting left (ISPL), right (rSPL) or bilateral activation. Our fMRI longitudinal study of hearing late learners (HLL) revealed bilateral involvement of SPL, but the effect of learning only in LSPL. This could indicate the dominance of ISPL for linguistic processing and rSPL for visuospatial attention. Here, we used transcranial magnetic stimulation (TMS) on HLL and deaf signers (DS). Pulses were delivered to ISPL, rSPL and occipital pole (control), during the performance of the lexical task. RSPL stimulation resulted in a decrease of accuracy in both groups, supporting the hypothesis about its general involvement in visuospatial attention. LSPL stimulation negatively affected the performance only in HLL, indicating its role in deciphering of the visuospatial aspects of phonology (more effortful for HLL and automatized in DS).

PS4.86. DOES THE INTERACTION OF ACTION AND ATTENTION PLAY A ROLE IN VISUAL STATISTICAL LEARNING?

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Visual statistical learning is a form of implicit learning of the statistical regularities among adjacent and nonadjacent elements across time and/or space. Although it may operate without conscious awareness, attention is necessary. To ensure attention, previous studies required participants to continuously respond to non-frequent targets (e.g., 25% of the elements). However, attention may also be sustained by requiring participants to continuously respond to frequent targets (e.g., 75%). This study investigates whether response type (frequent versus non-frequent) may facilitate or impede visual statistical learning of adjacent and nonadjacent dependencies given that action on elements enables the elements to be attended as a perceptual group. Learning is indexed by participants' correct accepts and false positives for items that were trained and untrained. A significant interaction between response type and dependency type (adjacent versus nonadjacent) is expected. Findings may provide evidence to support the

theoretical interaction of action, attention and statistical learning

PS4.87. THE FUNCTIONAL ROLE OF VECTION FOR QUIET STANDING: A STUDY USING EXPANDING AND CONTRACTING VISUAL STIMULI

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Vision plays a major role in maintaining stable standing, and optical flow induced by expanding-contracting visual stimuli is known to affect postural sway. Vection, the visual illusion of self-motion, also affects postural control. Furthermore, the visual field where stimuli are perceived is a key factor for both postural control and vection occurrence. In the present study, we examined whether postural sway is functionally dependent on vection. The subtended visual field and speed of the visual stimuli were experimentally manipulated. Our results showed that vection occurred for moving visual stimuli, and that the magnitude of both vection and postural sway increased with the speed of the stimuli. However, no significant correlation between vection and postural sway was found within any speed condition. The presence of vection therefore does not seem to influence postural sway, implying a functional dissociation between perception (visual illusion) and action (postural control).

PS4.88. COMPLEX ADDITION ORIENTS SPATIAL ATTENTION: EVIDENCE FROM TEMPORAL ORDER JUDGMENTS

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Recent research has suggested an association of spatial attention with mental arithmetic. Here, we used a temporal order judgment (TOJ) paradigm to probe the presence of horizontal attention shifts during the calculation of two-digit addition and subtraction problems. We varied the delay between the arithmetic problem presentation and the TOJ task to investigate the time course of attentional shifts. The response to the arithmetic problem was given after the TOJ task. In Experiment 2, we additionally varied the carry property of the arithmetic task to investigate the role of task difficulty. Both experiments revealed that complex addition problems induce attention shifts to the right indicating a recruitment of visuo-spatial attention mechanisms during mental calculation. However, no shift was observed for subtraction. Results were inconclusive regarding the time course of attentional shifts (Experiment 1 & 2). No

difference was found between the carry and non-carry condition (Experiment 2).

PS4.89. ROBOTS BEHAVING LIKE HUMANS: INSIGHTS FROM PUPILLOMETRY

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In the present study, we investigated whether an interaction with a robot that displays either human-like or mechanistic behaviours influences the likelihood and ease with which participants attribute to it intentionality. With the use of pupillometry, we examined participants' cognitive effort related to choosing between a mechanistic vs. intentional explanation of the robot's behaviour. Participants were instructed to observe the iCub which was programmed to display robot-like or human-like behaviour. After each session, participants had to complete a questionnaire (the InStance Questionnaire) while their pupillary response was recorded. In the questionnaire, they were choosing between intentional and mechanistic descriptions of iCub's behavior. Results showed that, participants' pupil diameter was greater after interacting with iCub in the robot-like condition, relative to the human-like condition. This shows that the robot's subtle behavioural characteristics have an impact on easiness in explaining its behavior.

PS4.90. DOES ACUTE ITCH INDUCE ATTENTIONAL HYPERVIGILANCE OR AVOIDANCE?

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Itch is an unpleasant somatosensory symptom that characterises many different health difficulties. There is limited research on itch and attentional bias, however, the existing research has indicated that those experiencing itch symptoms show an attentional bias towards itch-related pictures using the dot-probe paradigm (van Laarhoven et al., 2017, Psychological research). The current study aimed to replicate this finding using the emotional spatial cueing task. In a double-blinded design, 42 healthy participants received either an itch-inducing histamine prick test or a placebo prick test. Participants then completed an emotional spatial cueing task consistent itch-related words and control words. The results indicate that participants experienced attentional bias away from, or an avoidance of, itch related words. It is currently not known whether the opposite findings in our study and van Laarhoven et al are best explained as function of the type of paradigm (dot

probe vs emotional spatial cueing) or the type of stimuli used (words vs. pictures).

PS4.91. COMPLEXITY, INTEGRATION ERRORS AND RISK PREFERENCES

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Risk aversion has been studied with problems of varying complexity. However, the influence of complexity has been largely ignored and it is usually not included as a factor in cognitive models. We address this gap by studying the previously reported effect of complexity aversion with a dual approach involving perceptual and preferential decision problems. We investigate three possible causes of the effect: (i) direct influence of complexity on valuation (ii) indirect influence via unsystematic noise and (iii) indirect influence via systematic errors. We use a 2-factorial within-subjects design, manipulating complexity and type of task (perceptual or preferential) while controlling for expected value, variance, range and skewness. For data analysis, we employ a multilevel model analysis. Our results will reveal if previous findings of complexity aversion are due to asymmetric experiment designs, affected by an increase of unsystematic noise, or if there is a systematic bias caused by increased complexity.

PS4.92. ACCURACY IN ANS TEST AND THE EFFECT OF VISUAL PROPERTIES IN DIFFERENT FORMATS AND CONDITIONS

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Approximate number sense (ANS) is usually tested by "blue-yellow dot" test in which participants have to compare two sets of dots and to select a larger set. Numerous studies demonstrated that visual properties of sets had the effect on numerical judgments. In particular, accuracy of comparison was higher in congruent trials (where visual properties positively correlated with magnitude) than in incongruent (congruency effect). The aim of our study was to investigate the congruency effect in different conditions. We design new version of "blue-yellow dot" test where participants should compare sets of figures in different formats (intermixed vs. separated) and conditions (homogeneous figures or heterogeneous figures). We estimate congruency effect in different formats and conditions in sample of pupils in Russia (N = 304, age range 12-17 years). Our results demonstrated that congruency effect was higher

for separated format of presentation and in case homogeneous objects should be compared.

PS4.93. DISSOCIATING INSTRUCTION IMPLEMENTATION AND MEMORIZATION USING OSCILLATORY FEATURES

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The implementation of a new instruction requires its transformation from a declarative to a procedural, action-oriented format. Importantly, this transformation is thought to occur only when the final goal is to implement the instructed behavior, but not if the instruction only needs to be memorized. The present study aims at investigating this phenomenon by means of oscillatory activity in EEG. We use retro-cues to select a subset of encoded S-R mappings in a memorization and an implementation task. In both tasks we expect the retro-cue to select the relevant mappings. Only in the implementation condition it should also trigger instruction reformatting in an action-oriented format. In line with our hypotheses, preliminary results show that the retro-cue elicits similar mechanisms of attentional orientation (i.e., contralateral alpha suppression) in both tasks. Crucially, the implementation condition showed enhanced oscillatory features associated with cognitive control (i.e., increased theta) and motor-related activity (i.e., beta suppression).

PS4.94. THE INFLUENCE OF EMOTIONAL AND FOREIGN LANGUAGE CONTEXT IN LEARNING

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Prior research using single words has found reduced emotionality in a foreign language, but what happens if emotionality is conveyed throughout a longer text rather than being contained in a word? Would emotionality affect how well we remember and associate information? We asked participants to listen to descriptions of two invented countries and tested how well they remembered facts about these countries. Each participant listened to one positive and one neutral description, which half of the participants heard in their native language (Spanish) and the other half heard in their foreign language (English). Participants remembered facts they heard in positive contexts better than those learned in neutral contexts and participants did better in their native language than in their foreign language. Importantly, there was no interaction between language and emotionality, suggesting that the decrease in

emotionality in a foreign language observed in some areas might not extend to all areas.

PS4.95. AUDIO-VISUAL NUMBER IDENTIFICATION AS A PROXY FOR TRANSCODING: PERFORMANCE IN GERMAN- AND ENGLISH- SPEAKING CHILDREN

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Number transcoding is a demanding task for children in the first years of school. According to the ADAPT model, one source of difficulty is the load that transcoding procedures have on working memory. Language-specific features such as the presence of the inversion property in German are likely to represent a second source of difficulty, which might also require working memory resources. We investigated cross-linguistic differences in transcoding in 148 speakers of German, an inverted number language, and 249 English-speakers, a non-inverted language. Children were assessed longitudinally in Grade 1 and 2 with a multiple-choice number identification task requiring them to select the Arabic form of verbally presented one- to three-digit numbers. As expected, German-speaking children were less accurate than English-speaking children. Length effects indicating lower accuracy for longer numbers were observed, but were not related to inversion. Findings reveal differential involvement of working memory for distinct transcoding procedures across languages.

PS4.96. COGNITIVE BIASES IN EMOTION RECOGNITION ARE MODERATED BY STATE ANXIETY

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"Anxiety disorders are associated with selective processing of threat-related information. Recent research suggests, that acute anxiety episodes might be a key element of these cognitive biases. We examined how emotion perception and real-time psychophysiological measures during emotion perception are moderated by state anxiety. Musical segments inducing four emotions (fear, peacefulness, sadness, happiness) according to the literature were used. Participants were asked to define which emotion is being demonstrated, and to rate each emotion on scales regarding valence, arousal, and clarity. Interestingly, electrodermal lateralization prior to the appearance of emotion stimuli distinguished those who recognized emotions accurately, from those who miscategorized them. Results shown that low anxiety and high anxiety groups show opposing recognition bias in response to the emotion

peacefulness ($p = .040$) and differ in their electrodermal activity pattern. We conclude that state anxiety moderates emotion recognition and propose that electrodermal lateralization may be important in understanding cognitive biases."

PS4.97. IS THERE MORE ROOM TO IMPROVE? THE LIFESPAN TRAJECTORY OF PROCEDURAL LEARNING AND ITS RELATIONSHIP TO THE BETWEEN- AND WITHIN-GROUP DIFFERENCES IN AVERAGE RESPONSE TIMES

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Cognitive functions typically encompass several processes that can be differentially affected by age. Additionally, methodological issues arise when comparisons are made across groups that differ in basic performance measures, such as in average response times (RTs). Here we focus on procedural learning and demonstrate how disentangling subprocesses of learning and controlling for differences in average RTs can reveal different developmental trajectories across the human lifespan. Two hundred-seventy participants aged between 7 and 85 years performed a probabilistic learning task that enabled us to disentangle two processes of procedural learning: general skill and statistical learning. We found that participants' average speed affects general skill but not statistical learning measures. We present two analysis methods to control for average speed when comparing groups on other RT measures. Our findings suggest that children are superior learners in various aspects of procedural learning even when differences in average speed are controlled for.

PS4.98. DO OLDER ADULTS ADJUST THEIR TARGET MONITORING BEHAVIOR IN A PROSPECTIVE MEMORY TASK ACCORDING TO TASK INSTRUCTIONS?

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It has been shown that younger adults flexibly engage and disengage in monitoring processes of prospective memory (PM) according to task instructions. However, this process has been less studied in older adults. Using a flanker paradigm, we tested the spontaneous engagement in monitoring in younger and older adults under three conditions: A control condition, a standard PM condition and a PM delayed condition (i.e., participants were asked to delay a PM task, but then the PM targets were shown in a very salient

way). Results show both younger and older adults to engage in monitoring in the PM condition, but not in the control condition. Importantly, in the PM delayed condition both age groups equally did not show any sign of monitoring. Older adults, just as younger adults, seem to adjust their PM monitoring according to task instructions and are not misled by salient target cues.

PS4.99. READING SEMANTIC ANOMALOUS SENTENCES: THE EFFECT OF TASK INSTRUCTIONS

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The eyetracking technology can reveal when and how the reader becomes aware of a semantic anomaly in a sentence. Multiple factors can influence such process. In the present study we investigated the impact of psycholinguistic variables and task instructions on eyetracking metrics. Forty participants took part in two versions of the experiment: instructionless (simply look at the screen) and with instructions (read the sentences on the screen and answer to some comprehension question). Results indicate that readers fixate longer the anomalous word as compared to the control correct word. The effect is influenced by the word written frequency and, although it is amplified by the presence of task instructions, it is still significant in the context of no instructions. Results highlight the role played by semantic factors in the early stages of reading and might guide in designing tests exploring semantic knowledge in people with impairments in understanding instructions.

PS4.100. WORKING MEMORY TRAINING IMPROVES CHILDREN'S ACADEMIC AND COGNITIVE SKILLS AND BOOSTS BRAIN FUNCTIONAL CONNECTIVITY INVOLVING THE ATTENTIONAL NETWORKS

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Working memory (WM) training has implications for children's academic and cognitive skills. Here, trained children in WM showed significant improvement in non-verbal IQ, inhibition skills, math and languages abilities, and math grades compared with an active control group. As behavioral improvements may rely on children's abilities to control their attention, we focused on the benefits of our training in brain functional connectivity that involves the attentional networks (ATNs). When children were scanned in a resting state fMRI protocol, we observed stronger

relationships between inhibitory control improvements and connectivity in a right middle frontal gyrus (MFG) cluster in trained children. Seed-based analyses revealed that functional connectivity between the r-MFG and homolateral parietal and superior temporal areas were more strongly related to inhibitory control improvements in the training group. These findings highlight the relevance of WM trainings in boosting cognitive/academic performance and brain functional connectivity, enhancing maturation processes taking place during childhood.

PS4.101. ROUTE LEARNING AND AGEING: ARE OLDER ADULTS REALLY WORSE NAVIGATORS?

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In typical route learning paradigms, all participants are given the same exposure to an environment or route before their route knowledge is assessed. We present a series of experiments which investigated whether impaired route knowledge in older adults reflects a spatial deficit or reflects a reduction in learning rate driven by age-related slowing of cognitive processing. Younger and older participants either received the same amount of route training (Experiment 1) or were trained to criterion (Experiments 2 and 3). In Experiment 1 we found the expected age-related differences in associative cue and sequence knowledge. However, when we controlled for learning in Experiments 2 and 3, we found that older participants took longer to learn the route than younger participants, but the performance difference on the associative cue task was abolished. The age-related sequence knowledge deficit remained and resulted in older adults becoming disoriented when availability of landmark information was disrupted.

PS4.102. EXPERTISE REVERSAL EFFECT: THE COST OF GENERATING NEW SCHEMAS

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Experts show better mnemonic performance than novices, due to higher number of stored schemas, according to cognitive load theory. This advantage is hindered in nonoptimal situations, where experts show lesser performance than novices. We investigated expert train travelers, who develop their expertise in a train station. Normal versus disturb conditions were evaluated in the virtual environment of a Parisian station: Saint-Michel Notre Dame. Our

aim was to determine how cognitive resources vary according to expertise level of travelers, without modification of instructional design. We used three measures to evaluate cognitive load of travelers: Electrodermal activity for physiological analysis, NASA-TLX for subjective analysis, and factual and contextual memory for behavioral analysis. Expert travelers were expected to show higher cognitive load than novice travelers, in disturb condition. Our findings followed our prediction. Expert travelers generate new schemas, while processing instructional design in disturb condition, creating extraneous load and performing worse than novices.

PS4.103. A RANDOMIZED CONTROLLED TRIAL ON THE POTENTIAL BENEFITS OF A YEAR-LONG MINDFULNESS PROGRAM ON LOW-SES YOUNG CHILDREN'S EXECUTIVE FUNCTIONS

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According to recent meta-analytic results mindfulness interventions are the most effective approach for promoting executive function (EF) skills of typically developing children (Takacs & Kassai, in print). Based on these findings we assume that teaching mindfulness to young children in a preschool setting can be an effective way in reducing the cognitive disadvantage of low SES children. We developed and tested the effects of a year-long, child-friendly mindfulness program in which mindfulness practices are imbedded into a story framework. Based on the results of the pre-tests we confirmed that SES and EF skills are negatively related. After the first 10 sessions of the program we conducted an intermittent testing and its results showed that the mindfulness group overperformed the controls on a test of short-term memory ($F^1=6.12$, $p=.01$), but no differences were found on EFs. Further details about the program, and the results of the post-tests will also be presented.

PS4.104. THE IMPACT OF MENTAL TRAINING ON MOVEMENT EXECUTION AND IMAGERY QUALITY

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Due to similar brain activation during mental imagery (MI) and execution, a functional equivalence is postulated. Based on these findings, we compared sighted and blindfolded dart throws to discover the impact of a mental training on the MI quality after three months. Forty subjects passed through a test battery including 60 throws (VICON recorded), a visual memory task, two mental chronometry

tasks and the MIQ. Half of the throws were implemented blindfolded, followed by the subject's prediction about the dart position. During the visual memory task a matrix should be memorised and partly recalled to measure the retention performance. The MI-group completed a daily mental training. Improved hit ratios and position predictions, as well as more efficient movement execution and better memory skills are assumed in the MI-group during blind throw. If this is the case, blindfolded execution could be a good predictor for imagery quality.

PS4.105. MOTOR REPRESENTATIONS IN UNDERSTANDING SOCIAL RELATIONSHIP ACTION-SENTENCES

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Language describes how individuals intentionally interact with other people by means of action verbs that conceptually involve approach and avoidance motivation (Marrero, Gámez, Urrutia, Beltrán and Díaz, 2017). For example, "Alejandro accepted/rejected Marta in his group". The embodied simulation theory (henceforth, EST) predicts that if approach and avoidance motivations are differently encoded during reading, then they should also differ in their mental sensory-motor simulations. In contrast to physical actions, understanding of social relationship actions has not been examined from the perspective of embodied simulation. However, it would involve motor representations associated with the affective component of the approach/avoidance. In one experiment 40 participants read approach and avoidance sentences. Once the target of the action ("Marta" in the example) was display, they were prompted by an arrow (either in a forward or a backward direction) in the computer screen for pressing with their index finger the corresponding arrow in the keyboard, either forward or backward from a "rest" position (the key in the middle). The delay between target and arrow display was manipulated between-subject: 300 ms and 800 ms. Results showed that at 300 ms delay response latency tended to show interference in congruent conditions (approach verb-forward movement, avoidance verb-backward movement). In contrast, in 800 ms delay, latency showed significant facilitation from verbal encoding to motor response, but only in the congruent approach-forward movement condition. Results are discussed in the context of embodied simulation theory and representation of the meaning of social relationship actions verbally described.

PS4.106. CHOICE-INDUCED PREFERENCE CHANGE FOLLOWING JOINT COMPARED TO INDIVIDUAL DECISION MAKING

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We studied how joint, compared to individual, decisions can affect preferences. Previous works show that having chosen between two almost-equally-valued alternatives, individuals reevaluate the selected item more positively and/or the rejected item more negatively. According to cognitive dissonance theory, such a difficult decision arouses an unpleasant feeling (dissonance) which threatens the self-concept and hence motivates individuals to justify their choices. Shared responsibility in joint decisions, we hypothesized, may reduce the decision-related stress and its accompanying choice justification. We tested this prediction in 2 experiments using a modified Free-Choice paradigm. Dyads (experiment 1) and individuals (experiment 2) selected a single item from among two almost-equally-valued options. Choice justification was replicated in both individual and joint decisions and was significantly weaker for the joint decisions. Our findings are consistent with reduced choice justification due to weaker sense of responsibility for the joint decisions.

PS4.107. NONE OF MY BUSINESS: REDUCED AGENCY FOR THE CONSEQUENCES OF LIES

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People tell lies for the sake of anticipated benefits, risking harmful consequences of their dishonest actions elsewhere. How much do agents feel responsible for the consequences of their dishonest actions? Although lying is an integral part of the behavioral repertoire, truthful responding is predominant in human interactions and has to be overcome to respond dishonestly. We hypothesized that this inherent conflict and mental effort would diminish the feeling of responsibility (i.e., agency) for the consequences of dishonest compared to honest responses. We employed a paradigm with temporal binding as an implicit agency measure, i.e., interval estimates between a (dis)honest response and its sensory effects. We found reduced agency for lies and their consequences as dishonest compared to honest responses produced longer interval estimates. After this first step toward understanding agency in lying, future endeavors should explore agency for different instances of lies or in the presence of affective consequences.

PS4.108. LOW- AND MEDIUM-RATE AUDITORY STEADY-STATE RESPONSES IN DISORDERS OF CONSCIOUSNESS

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Diagnosis of consciousness in non-responsive patients with prolonged disorders of consciousness (PDOC) remains challenging. In this study, we investigated the capacity of auditory steady-state responses (ASSRs) for this purpose. We recorded EEG from 9 unresponsive wakefulness syndrome (UWS) and 8 minimally conscious (MCS) patients when stimulated with low- and medium-rate amplitude-modulated periodic tones: 4, 6, 8, 12, 20, 40 Hz. Next, we compared Relative Power (RP) and inter-trial Phase Coherence (PC) measures of brain response with behavioral clinical diagnosis of CRS-R scale. We observed strong positive correlations between individual total CRS-R scores and both mean PC (averaged across all stimulation rates) and 40 Hz RP measure. Additionally, these measures significantly differentiated between UWS and MCS patients groups. Overall, low- and medium-rate ASSRs might serve as an objective estimate of the level of consciousness in PDOC. This emphasize the role of auditory system integrity in assessing brain capacity for conscious processing."

PS4.109. SHARED NEURAL CORRELATES FOR EXECUTIVE CONTROL AND CONSCIOUSNESS ON A FRONTAL REGION

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Executive control elicited by conflict situations impairs conscious processing, and an interaction between both processes was found in the functional connectivity of frontoparietal regions (Martín-Signes, Paz-Alonso, & Chica, 2018). In this study, we used transcranial magnetic stimulation (TMS) to explore the causal role of the right supplementary motor area (rSMA) in the interaction between executive control and consciousness in 24 participants. TMS was applied to the rSMA or a control region (vertex) while participants performed a Stroop task concurrent with a conscious detection task of near-threshold Gabor stimuli. While for the vertex stimulation Stroop accuracy for incongruent trials was equal for seen and unseen trials, TMS over the rSMA decreased accuracy for the unseen trials. Also, white-matter microstructure of the superior longitudinal fascicle was related with the TMS effects. Our results support the hypothesis of executive control and consciousness sharing neural correlates on the frontal lobe.

PS4.110. PRIOR KNOWLEDGE EXPLAINS INDIVIDUAL DIFFERENCES IN THE READING ALOUD OF ENGLISH NON-WORDS

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Prior experience shapes our performance on various tasks, particularly those that involve language (Siegelman et al., 2018). This talk will take a deep dive into individual differences that are particularly striking in the reading aloud of English nonwords where a single nonword such as KNOUCH can evoke dozens of different responses across subjects (Pritchard et al., 2012). We will present evidence that this variability boils down to differences in orthography-to-phonology statistics that we have extracted from a life-long reading experience. We will conclude by arguing that individual differences in nonword reading are a function of individuals' vocabulary sizes.

PS4.111. EMBODYING THE SELF-REFERENCE EFFECT: ENHANCING MEMORY THROUGH MOVEMENT TOWARD THE SELF

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The self-reference effect describes a memory advantage for information associated with the self. Oakes and Onyper (2017) found that engaging in motion towards a representation of oneself, whether physical (like our bodies) or disembodied (like our mobile phones), activates self-referential processing. In a series of experiments, we examined whether self-referential processing occurred when a virtual representation of the self was used: a selfie. Participants uploaded a selfie and then completed a word categorization task by moving neutral words toward their own selfie or toward another individual's selfie. We found that both recognition memory and free recall of words categorized by self-directed movements were facilitated regardless of participants' intention to memorize the stimuli or the movement direction with respect to one's physical body. In contrast, self-directed movement did not enhance implicit memory. These results suggest that movement can enhance memory by inducing self-referential processing, even when the self is disembodied.

PS4.112. THE INFLUENCE OF CATHODAL AND ANODAL TDCS OF WERNIKE'S AREA ON THE ACQUISITION OF NOVEL LEXICON

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The brain mechanisms underpinning word acquisition remain poorly understood. We investigated the role of Wernicke's area in acquiring novel concrete and abstract words using transcranial direct current stimulation (tDCS). Experimental participants learnt new words contextually after cathodal, anodal or sham tDCS. Cathodal group demonstrated better accuracy than sham group in lexical decision task when responding to pseudoword competitors of novel abstract words, suggesting reduced lexical competition/poorer acquisition. This was also reflected in slower recognition for new abstract words after cathodal than anodal tDCS following an overnight consolidation stage. Anodal tDCS, on the contrary, led to enhanced consolidation of concrete words, indicated by lowered (in comparison to cathodal and sham) accuracy for their competitors. In conclusion, Wernicke's area tDCS can influence integration of new words into the lexicon selectively, depending on stimulation mode. This suggests overlapping but distinct mechanisms for acquiring these knowledge types. Supported by RF Government grant No.14.W03.31.0010.

PS4.113. FROM COGNITIVE MECHANISMS TO PERSONALITY TRAITS: WHAT IMPACTS DEDUCTIVE REASONING?

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In everyday life, reasoning is an important cognitive skill to make inferences and decisions about information with which we are presented. While empirical research on intelligence has suggested that there are sources of common variance among personality and intellectual ability measures, there is a lack of research on investigating underlying individual differences in reasoning performance under consideration of personality traits. In three experimental sessions, the present research analysed how the reasoning performance of 50 participants was related to various, assumed influential factors (e.g., personality traits, cognitive abilities, working memory capacity). To compare and evaluate current cognitive theories in their ability to describe interindividual differences, the complex interactions of assumed influential factors are discussed with a focus on their association with better reasoning performance. We reflect how the integration of the fields of human reasoning and personality can help to assess assumed underlying cognitive mechanisms involved in reasoning.

PS4.114. ORIENT YOUR ATTENTION IN TIME: A PARADIGM TO ASSESS ENDOGENOUS, EXOGENOUS AND RHYTHMIC MODES OF ORIENTING

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Temporal orienting refers to the ability to use implicit or explicit sensory information to orient attention to a particular moment in time. Attention in time can be oriented in four ways depending on the nature of temporal cues: endogenous temporal orienting, rhythmic orienting, sequential effects and foreperiod effect. We developed a paradigm to investigate these four components in a single task. The aim was to explore inter- and intra-individual differences in the ability to efficiently use different types of cues to orient attention. To study endogenous orienting, cues were predictive of stimulus-target latency (Coull&Nobre, 1998), while rhythmic cueing was achieved by the means of a succession of synchronous or asynchronous auditory cues (Cutanda et al, 2015). The results showed a positive correlation between endogenous and exogenous temporal orienting. This paradigm could be used to study developmental trajectories and also to investigate specific temporal deficits in clinical populations.

PS4.115. GAZE IS BIASED TOWARDS ATTENDED MEMORIZED ITEM LOCATIONS IN AN IMMERSIVE AND UNCONSTRAINED VIRTUAL REALITY ENVIRONMENT

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When we direct covert attention in external visual space, microsaccades tend to be biased in the corresponding direction. This tight coupling between the brain's oculomotor system and attentional focusing persists when attention is directed internally to the spatial contents of visual working memory, biasing gaze towards the memorized location of attended memory items. This is usually investigated in laboratory tasks with restrained head movements, however, microsaccades are rare when head movements are unconstrained. Using a virtual reality set-up, which allows participants to freely move their head, we demonstrate that focusing internal attention to locations in memorized space is still associated with a gaze bias in the same direction. This reveals that the involvement of the oculomotor system in internally directed attentional focus persists under more ecologically valid conditions without head movement restriction, and opens exciting new avenues for

tracking oculomotor contributions to visual working memory in ecological 3-dimensional environments.

PS4.116. MENTAL IMAGERY IN TYPICAL DEVELOPMENT AND ADHD

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As we communicate, navigate and problem-solve our way through life, we are constantly generating and manipulating mental representations. MI involves sustained attention and has also been found to be positively associated with working memory (WM). Children with attention-deficit/hyperactivity disorder (ADHD) are also characterised as possessing a WM impairment, however recent investigations have highlighted extensive intra-individual variation in this behaviourally defined disorder. Nevertheless, research is yet to investigate MI in ADHD. This study employs a case-control design to investigate differences between MI abilities, alongside WM, in typical development (TD) and children with ADHD (age 8-11 years, N=62). Secondly, a latent profile analysis will be conducted to investigate intra-individual variability in both TD and ADHD to derive distinct profiles of ability (N=123). Data collection will be completed by July 2019. It is expected that this research will further elucidate the relationship between MI, WM and attention.

PS4.117. LONG RANGE TEMPORAL CORRELATION DURING RESTING STATE PREDICTS EMBODIED SENSE OF OWNERSHIP

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Various studies on the embodied sense of self (ESS) have examined the temporal neural basis for its formation. While previous studies have paid less attention to the subjectivity of the ESS itself, recently, a novel questionnaire has been developed that evaluates the subjectivity of the everyday anomalous ESS experience (ESS Scale; ESSS). The ESSS contains three factors: ownership, narrative, and agency. However, the relationship between the subjectivity of ESS and the temporal neural basis remains unclear. Here, we examined the relationship between ESSS and the long-range temporal correlation (LRTC) of intrinsic brain activity. We observed a positive correlation between the

degree of ownership and beta range LRTC at the front-central region. This result suggests the sense of ownership in everyday life is associated with the temporal structure of intrinsic brain activity.

PS4.118. IMPACT OF LEVEL OF IMMERSION IN VIRTUAL REALITY ON EMOTIONS, SENSE OF PRESENCE AND MEMORY OF YOUNG ADULTS AND CHILDREN
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The sense of presence in virtual reality (the user's feeling of "being there" in a VR) is related to the level of immersion and the emotional experience. It is not clear how these two factors are exactly involved in the sense of presence and whether they act independently or interact. In addition, the age of users might impact this involvement. The goal of the present study was to examine the role of immersion, emotion and age in the sense of presence in VR. The immersion was manipulated by the image quality (high versus low) and the VR device (Head-mounted Display versus Computer Screen) and emotion by presenting negative, positive and neutral content. Young adults and children were evaluated. We collected the pupil diameter and head movements as objective indicators and subjective evaluation of sense of presence and emotional valence and arousal. Results show interaction of emotion, image quality and immersion.

PS4.119. MID-FRONTAL THETA DURING CONFLICT IN A VALUE-BASED DECISION TASK
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Mid-frontal theta is a sensitive marker for cognitive conflict. However, most research focusses on cognitive control paradigms (e.g., the Flanker task). Here, we ask if mid-frontal theta is also sensitive to response conflicts within value-based decision-making. We record EEG activity during a value-based binary choice paradigm. We manipulate response conflict through choice difficulty and through sequence effects. We manipulate sequence effects by biasing participants towards one option for two trials and then testing how that affects the subsequent decision. The behavioral results show the expected effects: Decision times are longer in difficult decisions and in decisions that switch from a previous choice, and participants show a tendency to repeat the previous choice. We show that response-locked theta power is increased for choice switches as compared to choice repetitions, but we find no effect of

difficulty. Hence, mid-frontal theta seems to track sequence effects, but not difficulty, in value-based decisions.

PS4.120. THE ROLE OF SELF-REFERENCING ON FALSE MEMORIES IN THE DRM PARADIGM
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Processing information in relation to oneself (i. e., self-referencing) relative to others may increase both false and true recognition elicited in the Deese-Roediger-McDermott (DRM) paradigm. This self-referencing effect may also extend to processing information to close-other. The purpose of the present study is to examine the effect of self, close-other (i. e., friends and family members), and unknown-other (i. e., unknown individuals) referencing on DRM false memories. We hypothesize that self-reference condition will increase both true and false memories compared to close-other, unknown-other reference and control (i.e., no-reference) conditions. We, also, expect that, close-other condition will be more effective on true and false memories relative to unknown-other referencing and control condition. Data collection is in progress. If these hypotheses are confirmed, this will indicate that self-referencing improves true memories albeit producing false memories. The same effect will be observed in close-other reference condition but the effect is weaker than self-referencing.

PS4.121. VALIDATING DISCRETE AND CONTINUOUS MEMORY MODELS FOR PAIRED-WORD RECOGNITION: A BASE-RATE MANIPULATION STUDY
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In a typical recognition-memory task, individuals study word lists and have to subsequently classify single words according to whether they have been studied before or not. Recent studies have shown that joint responses to pairs of words differ from two separate responses to the same words. Extensions of the two dominant theoretical accounts of single-item recognition memory, discrete and continuous memory models, have been shown to be successful in such a joint-response format to pairs of words. However, these models have not been validated so far. The present study is a first pre-registered validation study of that kind. Globally, the two model classes will be evaluated by their ability to account for base-rate differences in co-occurrences of studied and new words within pairs of

words. Additionally, behavioral differences between the base-rate conditions have to be reflected in theoretically meaningful parameters.

PS4.122. MEASUREMENT THE COGNITIVE REFLECTION BEYOND THE NUMERACY

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The Cognitive Reflection Test (Frederic, 2005) was designed to measure individual differences in thinking styles (intuitive vs reflective). It is argued that solving these tasks

correctly, requires inhibition of incorrect intuitive responses. The number of studies have shown that individuals who are more reflective, are also less biased, show lower level of paranormal beliefs and make better decisions. However, the numerical structure of CRT raises questions about the accuracy of this interpretation, in particular CRT is highly correlated with statistical numeracy. We plan to present the results of our study where we compared non-mathematical version of reflection test: Verbal-CRT (Sirota, 2019), numerical CRT and their relationships with numeracy, math anxiety and cognitive biases such as belief bias and paranormal beliefs.

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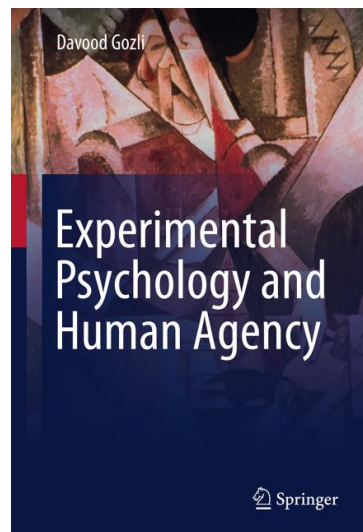
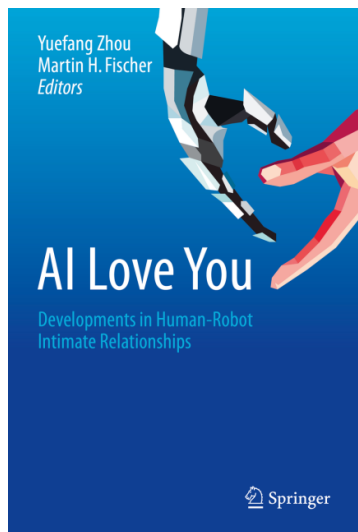
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