Eleventh Conference of the European Society for Cognitive Psychology

PROCEEDINGS

Edited by
André Vandierendonck
Marc Brysbaert
Koen Van Der Goten

ESCP/Academia Press

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Phone: +32-(0)9-233 8088, Fax: +32-(0)9-233 1409
E-mail: info@story.be.

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Contents

PREFACE

This book contains the programme and the abstracts of the XIth Conference of the European Society for Cognitive Psychology. We have tried to design this book as a handsome tool for use during the conference, but also for reference purposes later.

First, there is a schematic overview of the sessions per day. Next, a more detailed but still schematic overview is presented per half day. Each talk is indicated by its authors and a reference number, which refers to the number of the abstract. Finally, a detailed programme is given per session. In this overview, the same reference numbers are used. A similar procedure is followed for the poster sessions, with numbers referring to the abstracts.

As an additional help, at the back there is an index with all authors or co-authors and the pages where they are mentioned. Pages in boldface refer to the abstract.

The abstracts are presented one per page. They are grouped and numbered separately for the keynote lectures, the symposium contributions, the thematic sessions and the poster sessions. All the abstracts submitted were carefully proofread and obvious typing and spelling errors were corrected, and sometimes more extensive editing was performed. However, not all errors were corrected in order not to violate the ideas expressed by the authors of the abstract.

The following persons have contributed to the preparation of the conference: Bernie Caessens, Wendy De Moor, Vicky Dierckx, Vicky Franssen, Mandy Ghyselinck, Ruben Hemelsoen, Eva Kemps, Jan Lammertyn, Elie Ratinckx, Bert Reynvoet, Kristoff Spruyt, Els Stuyven, Antoine Tavernier, Hans Vandierendonck and Marilou Vandierendonck. We are grateful for their invaluable help.

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André Vandierendonck
Marc Brysbaert
Koen Van der Goten

Chapter 1

CONFERENCE PROGRAMME

1.1 OVERVIEW

Schedule Wednesday September 1, 1999				
	Room A	Room B	Room C	Room D
13:30	Visual Word Recognition I	Implicit and Sequence Learning	Discourse Processing	Short-Term and Working Memory
17:45	Broadbent Lecture: Levelt			

Schedule Thursday September 2, 1999				
	Room A	Room B	Room C	Room D
08:45	Symposium Language Production	Action Control	Symposium Episodic Memory	Categorization
11:45	Lunch Break			
13:30 15:40	Speech Production	Motor Performance Cognition I	Symposium Visuo-Spatial Memory	Symposium Time Estimation
16:30	Poster Session			
18:00	Keynote Lecture: Meyer & Kieras			

Schedule Friday September 3, 1999				
	Session 1	Session 2	Session 3	Session 4
08:45	Symposium Bilingual Lexical Processing	Symposium Executive Functions	Long-Term Memory I	Symposium Deductive Reasoning
11:45	Lunch Break			
13:30	Speech Perception	Attention	Long-Term Memory II	Thinking and Reasoning
17:30	Keynote Lecture: Dehaene			
18:45	Business Meeting $\mathcal{ESC}_o\mathcal{P}$			

Schedule Saturday September 4, 1999				
	Session 1	Session 2	Session 3	Session 4
08:45	Visual Word Recognition II	Task-Switching & Executive Functions	Symposium Numerical Cognition	Visual Perception
11:45	Lunch Break			
13:30	Visual Word Recognition III	Symposium Visual Attention	Cognition II	Symposium Spatial Cognition
15:40	Poster Session			
17:15	Young Psychologist Lecture: Brandimonte			
19:30	Busses leave for dinner			

1.2 CONDENSED SCHEDULE

1.2.1 Wednesday Afternoon

	Room A **Visual Word Recognition I**	Room B **Implicit & Sequence Learning**	Room C **Discourse Processing**	Room D **Short-Term and Working Memory**
13:30	Holender & Duscherer (39)	Stock & Hoffmann (94)	Wijnen, Troost & Quené (112)	Kemps (42)
13:55	Kinoshita & Knox (45)	Destrebecqz & Cleeremans (18)	Pickering & Branigan (75)	Fischer (24)
14:20	Bowers (9)	Koch (48)	Noordman (68)	Postma (78)
14:45	Duscherer & Holender (21)	Raijmakers, Dolan & Molenaar (79)	Vonk & Bestgen (110)	Denis (17)
15:10	**Coffee break**			
15:40	Wagenmakers & Raaijmakers (111)	Sebald, Hoffmann & Stöcker (90)	Megherbi, Ehrlich & Loridant (63)	Bajo (3)
16:05	Zagar & Mathey (116)	Visser, Raijmakers & Molenaar (109)	Gulgoz, Aktunc & Eskenazi (32)	Roßnagel (84)
16:30	Herdman & Strain (38)	Ziessler (117)	Beyer, Guthke, Kruger & Mehlau (6)	Palladino, Cornoldi, De Beni & Pazzaglia (72)
16:55	Lupker & Pexman (59)	Melis, Soetens & Notebaert (64)	Blanc & Tapiero (7)	d'Ydewalle & Brunfaut (22)
17:45	Welcome by the Rector and the representative of the Mayor			
18:00	Levelt (Broadbent Lecture) (K-1)			

	Room A **Symposium Language Production**	Room B **Action Control**	Room C **Symposium Episodic Memory**	Room D **Categorization**
8:45	La Heij & Starreveld (S-2)	Elsner & Hommel (23)	Steffens (S-58)	Davidoff, Davies & Roberson (15)
9:10	Pechmann (S-3)	Soetens, Notebaert & Melis (92)	Koriat, Edry & de Marcas (S-59)	Marques (61)
9:35	Jescheniak, Schriefers & Hantsch (S-4)	Band (4)	Bäuml (S-60)	Hagmayer & Waldmann (34)
10:00	**Coffee break**			
10:30	Bölte, Zwitserlood & Dohmes (S-5)	Kunde, Hoffmann & Zellmann (50)	Mulligan (S-61)	Thibaut & Cleeremans (98)
10:55	Timmermans, Schriefers, Sprenger & Dijkstra (S-6)	Stuyven, Dejonckheere & Ghyselinck (96)	Engelkamp (S-62)	Yehene & Tzelgov (114)
11:20	Olsthoorn & Kempen (S-7)	Donk, Godijn & Bekkering (20)	Discussion (Buchner)	Storms, De Wilde & Ruts (95)
11:45	**Lunch break**			

1.2.3 Thursday Afternoon

	Room A **Speech Production**	Room B **Motor Performance**	Room C **Symposium Visuo-spatial working memory**	Room D **Symposium Estimating duration**
13:30	Grabowski (30)	Knoblich, Seigerschmidt & Prinz (47)	Logie (S-51)	Wearden (S-23)
13:55	Hartsuiker, Schriefers, Bock & Kikstra (35)	Bogaerts & Swinnen (8)	Quinn & McConnell (S-52)	Burle, Casini, Macar & Vidal (S-24)
14:20	Roelofs (82)	De Maeght, Knuf & Prinz (16)	Zimmer & Speiser (S-53)	Pouthas (S-25)
14:45	**Coffee break**			
		Cognition I		
15:15	Schiller & Caramazza (88)	Towse, Redbond, Price & Cook (100)	Mecklinger, Bosch & Grünewald (S-54)	Brown & Bennett (S-26)
15:40	Vigliocco, Franck & Collina (108)	Buchner (11)	Mohr (S-55)	Dutke (S-27)
16:05	Discussion (Levelt)	Los (57)	Greenlee, Reinvang, Magnussen & Kraemer (S-56)	Michon (S-28)
16:30	Poster Session I			
18:00	Keynote Lecture: Meyer & Kieras (K-2)			

1.2.4 Friday Morning

	Room A **Symposium Bilingual Lexical Processing**	Room B **Symposium Executive Functions**	Room C **Long-Term Memory I**	Room D **Symposium Deductive reasoning**
08:45	Léwy & Grosjean (S-30)	Allport & Wylie (S-9)	Vernon & Lloyd-Jones (107)	Capon, Handley & Dennis (S-37)
09:10	Dijkstra & van Heuven (S-31)	De Jong (S-10)	Marchal & Nicolas (60)	Mackiewicz (S-38)
09:35	Frenck-Mestre, Grainger, Bueno & Schuller-Guillo (S-32)	Dreisbach, Haider & Kluwe (S-11)	Kowalczyk (49)	Monaghan (S-39)
10:00	**Coffee break**			
10:30	Sanchez-Casas & Garcia-Albea (S-33)	Hommel & Eglau (S-12)	Nevers & Versace (67)	Roberts (S-40)
10:55	De Groot (S-34)	Mayr (S-13)	Rossi-Arnaud, Turella & Verrocchio (83)	Carriedo, Garcia-Madruga, Moreno & Gutiérrez (S-41)
11:20	Kroll, Dijkstra, Janssen & Schriefers (S-35)	Monsell, Yeung & Azuma (S-14)	Olivetti Belardinelli & Rossi-Arnaud (70)	Schaeken (S-42)

1.2.5 Friday Afternoon

	Room A **Speech Perception**	Room B **Visual Attention**	Room C **Long-Term Memory II**	Room D **Thinking and Reasoning**
13:30	Tabossi, Collina, Mazzeti & Sbisa (97)	Cohen & Shoup (14)	Helstrup (37)	McCloy & Byrne (62)
13:55	Peperkamp, Dupoux & Sebastien (73)	Kennedy (43)	Pohl (76)	Dierckx & Vandierendonck (19)
14:20	Spinelli, Segui & Radeau (93)	Chorev & Henik (13)	Tversky & Marsh (102)	Schroyens, Schaeken & d'Ydewalle (89)
14:45	Goetry, Kolinsky, Mousty & Morais (29)	Bekkering & Pratt (5)	Yonker, Herlitz & Nilsson (115)	Keinath & Krems (41)
15:10	**Coffee break**			
		Attention		
15:40	Fougeron, Frauenfelder & Content (25)	Lupiáñez & Ruz (58)	Bucks & Conway (12)	Green (31)
16:05	Frauenfelder, Banel & Perruchet (26)	Langton & Bruce (52)	Baddeley, Vargha-Khadem & Mishkin (2)	Saariluoma (86)
16:30	Bachmann, Andersen & MacDonald (1)	Mitterer, La Heij & van der Heijden (66)	Smith (91)	Nückles & Bromme (69)
17:30	Keynote Lecture: Dehaene (K-3)			
18:30	Business Meeting			

	Room A **Visual Word Recognition II**	Room B **Task Switching and Executive Functions**	Room C **Symposium Numerical Cognition**	Room D **Visual Perception**
08:45	Lemhöfer & Radach (56)	Hagendorf, Fischer, Grattenthaler & Voigt (33)	Lochy (S-16)	Kerzel (44)
09:10	Torres, Rodríguez-Santos, Garcia Orza & Santana (99)	Kleinsorge, Heuer & Schmidtke (46)	Fias, Brysbaert, Lauwereyns & d'Ydewalle (S-17)	Verfaillie, De Graef & Gysen (105)
09:35	Transler, Gombert & Leybaert (101)	Pösse & Hommel (77)	Willmes, Kemeny, Weis & Pollrich (S-18)	Jüttner & Rentschler (40)
10:00	**Coffee break**			
10:30	Sandra, Geudens & Taelman (87)	Vandierendonck, Caessens, De Vooght & Van der Goten (104)	Thioux (S-19)	Gellatly, Cole & Blurton (27)
10:55	Havelka & Frankish (36)	Ridderinkhof (81)	LeFevre, Lei & Mullins (S-20)	Leder (55)
11:20	Tzelgov, Baron & Yehene (103)	Oomen & Postma (71)	Lemaire, Lecacheur, Farioli & Duverne (S-21)	Rouw & de Gelder (85)

1.2.7 Saturday Afternoon

	Room A **Visual Word Recognition III**	Room B **Symposium Visual Attention**	Room C **Cognition II**	Room D **Symposium Spatial Cognition**
13:30	Lange & Content (51)	Schneider (S-44)	Larsen, Bundesen, Kyllingsbæk & Law (53)	Klippel (S-65)
13:55	Perea & Carreiras (74)	Theeuwes, Kramer & Atchley (S-45)	Ratinckx, Brysbaert & Reynvoet (80)	Vorwerg (S-66)
14:20	Giraudo & Grainger (28)	Gomez Milan & Tornay (S-46)	Vernier & Koenig (106)	Shevelan (S-67)
14:45	Laudanna & Caramazza (54)	Müsseler (S-47)	Brennen, Martinussen, Hansen & Hjemdal (10)	Gattis & Molyneaux (S-68)
15:10	Meunier & Marslen-Wilson (65)	Hoffmann & Kunde (S-48)	Wohlschläger, Bekkering & Gattis (113)	Discussion (Tversky)
15:40	Coffee & Poster Session II			
17:15	Young Psychologist Lecture: Brandimonte (K-4)			

1.3 WEDNESDAY

Afternoon. Room A: Visual Word Recognition I

Chair: Dijkstra

13:30–13:50 Holender & Duscherer. *Semantic activation without conscious identification in visual masking: A re-reapraisal.* (39)

13:55–14:15 Kinoshita & Knox. *New association priming effect in the lexical decision task: Conceptual or perceptual?* (45)

14:20–14:40 Bowers. *Long-term priming for written words is a by-product of learning within the orthographic system.* (9)

14:45–15:05 Duscherer & Holender. *Semantic priming from parafoveal words.* (21)

15:10–15:40 Coffee break

15:40–16:00 Wagenmakers & Raaijmakers. *Prior study of an orthographically similar word causes facilitation: Competitive processes re-examined.* (111)

16:05–16:25 Zagar & Mathey. *On the reality of an inhibition mechanism during word visual recognition* (116)

16:30–16:50 Herdman & Strain. *The role of imageability in word naming: An individual differences analysis.* (38)

16:55–17:15 Lupker & Pexman. *Does feedback consistency explain polysemy and homophone effects in visual word recognition?* (59)

Evening. Room A: The Broadbent Lecture.

Chair: Engelkamp

17:45–18:00 Welcome by the Rector and the representative of the Mayor

18:00–19:00 Levelt. *Word for word: Multiple lexical access in speech production.* (Broadbent Lecture) (K-1)

19:00 Reception

Afternoon. Room B: Implicit and Sequence Learning

Chair: Hoffmann

13:30–13:50	Stock & Hoffmann. *Intentional fixation in learning.* (94)
13:55–14:15	Destrebecqz & Cleeremans. *Dissociating conscious and unconscious influences in sequence learning.* (18)
14:20–14:40	Koch. *Response preparation in sequence learning: Effects of stimulus-response compatibility.* (48)
14:45–15:05	Raijmakers, Dolan, Molenaar. *Finite mixture distribution models of simple discrimination learning.* (79)
15:10–15:40	Coffee break
15:40–16:00	Sebald, Hoffmann & Stöcker. *Learning to produce a sequence of stimuli is easier than learning to respond to a sequence of stimuli.* (90)
16:05–16:25	Visser, Raijmakers & Molenaar. *A comparison between predictions and reaction times in implicit sequence learning.* (109)
16:30–16:50	Ziessler. *Is there more than response-effect learning under implicit serial learning conditions?* (117)
16:55–17:15	Melis, Soetens & Notebaert. *Implicit learning of first and higher order sequential dependencies.* (64)

Evening. Room A: The Broadbent Lecture.

Chair: Engelkamp

17:45–18:00	Welcome by the Rector and the representative of the Mayor
18:00–19:00	Levelt. *Word for word: Multiple lexical access in speech production.* (Broadbent Lecture) (K-1)
19:00	Reception

Afternoon. Room C: Discourse Processing

Chair: Kennedy

13:30–13:50	Wijnen, Troost & Quené. *Prosodic phrasing and relative clause attachment in a three-site context.* (112)
13:55–14:15	Pickering & Branigan. *Word order and conceptual effects in syntactic priming.* (75)
14:20–14:40	Noordman. *Causal knowledge and language processing.* (68)
14:45–15:05	Vonk & Bestgen. *Preposed adverbial phrases in processing episode-discontinuous sentences.* (110)
15:10–15:40	Coffee break
15:40–16:00	Megherbi, Ehrlich & Loridant. *Do poor readers suffer a specific deficit in anaphor processing? On-line studies of listening comprehension.* (63)
16:05–16:25	Gulgoz, Aktunc & Eskenazi. *Recall of text information in two languages by bilinguals.* (32)
16:30–16:50	Beyer, Guthke, Kruger & Mehlau. *Integration of knowledge on sentence comprehension measured by reaction times and pupil dilation.* (6)
16:55–17:15	Blanc & Tapiero. *Multidimensional situation models.* (7)

Evening. Room A: The Broadbent Lecture.

Chair: Engelkamp

17:45–18:00	Welcome by the Rector and the representative of the Mayor
18:00–19:00	Levelt. *Word for word: Multiple lexical access in speech production.* (Broadbent Lecture) (K-1)
19:00	Reception

Afternoon. Room D: Short-Term and Working Memory

Chair: Logie

13:30–13:50	Kemps. *The role of structural complexity in visuo-spatial working memory.* (42)
13:55–14:15	Fischer. *Timing in the Corsi blocks task.* (24)
14:20–14:40	Postma. *On the relation between different measures of spatial memory.* (78)
14:45–15:05	Denis. *How to go from A to B? A cognitive approach to the production, comprehension, and use of route directions.* (17)
15:10–15:40	Coffee break
15:40–16:00	Bajo. *Working memory capacity and executive functions in language interpretation.* (3)
16:05–16:25	Roßnagel. *Cognitive load and the processing of feed-back in oral instructions.* (84)
16:30–16:50	Palladino, Cornoldi, De Beni & Pazzaglia. *Working memory and memory for a passage in children who are poor comprehenders.* (72)
16:55–17:15	d'Ydewalle & Brunfaut. *Prospective remembering of Korsakoffs and alcoholics as a function of the ongoing task.* (22)

Evening. Room A: The Broadbent Lecture.

Chair: Engelkamp

17:45–18:00	Welcome by the Rector and the representative of the Mayor
18:00–19:00	Levelt. *Word for word: Multiple lexical access in speech production.* (Broadbent Lecture) (K-1)
19:00	Reception

1.4 THURSDAY

Morning. Room A: Symposium Language Production:Encoding processes, and representations (S-1)

Chair: Zwitserlood

08:45–09:05 La Heij & Starreveld. *Phonological facilitation in gender decision.* (S-2)

09:10–09:30 Pechmann. *Activation of syntactic information during speech production.* (S-3)

09:35–09:55 Jescheniak, Schriefers & Hantsch. *The production of gender-marked pronouns.* (S-4)

10:00–10:30 *Coffee break*

10:30–10:50 Bölte, Zwitserlood & Dohmes. *The influence of tulips, robes, and roses on rose: Semantic, phonological, and morphological priming in speech production.* (S-5)

10:55–11:15 Timmermans, Schriefers, Sprenger & Dijkstra. *Describing simple events: Experiments on incremental grammatical encoding.* (S-6)

11:20–11:40 Olsthoorn & Kempen. *The cognitive architecture of grammatical encoding and decoding: Evaluating the single-processor hypothesis using a picture-sentence interference test.* (S-7)

Morning. Room B: Action Control

Chair: Bekkering

08:45–09:05 Elsner & Hommel. *Action priming by learned effects under variations of contingency and contiguity.* (23)

09:10–09:30 Soetens, Notebaert & Melis. *Simon effects in serial RT tasks: An attention-shift account.* (92)

09:35–09:55 Band. *Psychological refractory period and aging.* (4)

10:00–10:30 *Coffee break*

10:30–10:50 Kunde, Hoffmann & Zellmann. *Response preparation includes the anticipation of response effects.* (50)

10:55–11:15 Stuyven, Dejonckheere & Ghyselinck. *The influence of spatial compatibility on exogenous and endogenous saccades.* (96)

11:20–11:40 Donk, Godijn & Bekkering. *Saccadic target selection during visual search.* (20)

Morning. Room C: Symposium Episodic Memory (S-57)

Chair: Engelkamp & Buchner

08:45–09:05 Steffens. *Motivated memory revisited.* (S-58)

09:10–09:30 Koriat, Edry & de Marcas. *What do we know about what we cannot remember?* (S-59)

09:35–09:55 Bäuml. *Retrieval mechanisms in free recall of categorized item lists: A multinomial modeling analysis.* (S-60)

10:00–10:30 *Coffee break*

10:30–10:50 Mulligan. *The perceptual-interference effect and the item-specific-relational distinction.* (S-61)

10:55–11:15 Engelkamp. *Item, order and categorical information in episodic memory of self-performed and watched actions.* (S-62)

11:20–11:40 Buchner. *Discussion*

Morning. Room D: Categorization

Chair: Bajo

08:45–09:05	Davidoff, Davies & Roberson. *Are colour categories universal? Replications and new evidence from as stone-age culture.* (15)
09:10–09:30	Marques. *Category, features, modality and the living things dissociation in semantic memory.* (61)
09:35–09:55	Hagmayer & Waldmann. *How categories influence causal learning.* (34)
10:00–10:30	*Coffee break*
10:30–10:50	Thibaut & Cleeremans. *Categorization with an explicit rule: Modeling the effect of associated properties in a connectionist framework.* (98)
10:55–11:15	Yehene & Tzelgov. *Exemplar based learning and its transfer.* (114)
11:20–11:40	Storms, De Wilde & Ruts. *The instantiation principle re-evaluated.* (95)

Afternoon. Room A: Speech production

Chair: Kempen

13:30–13:50 Grabowski. *High-level processes in language production: The verbal diagnosis of knowledge.* (30)

13:55–14:15 Hartsuiker, Schriefers, Bock & Kikstra. *Morphophonological influence on the construction of subject-verb agreement.* (35)

14:20–14:40 Roelofs. *Shared phonological processes and representations in bilingual speakers.* (82)

14:45–15:15 *Coffee break*

15:15–15:35 Schiller & Caramazza. *Noun morphology in German language production.* (88)

15:40–16:00 Vigliocco, Franck & Collina. *Gender agreement in language production I: When sex hits syntax.* (108)

16:05–16:25 Levelt. *Discussion: Speech production.*

Late Afternoon. Poster Session I

Evening. Room A: Plenary Keynote Lecture

Chair: Vandierendonck

18:00–19:00 Meyer & Kieras. *Executive-Process Interactive Control (EPIC): A cognitive architecture for comprehensive precise computational modeling of human multiple-task performance in laboratory and real-world contexts.* (K-2)

Afternoon. Room B: Motor Performance

Chair: Soetens

13:30–13:50 Knoblich, Seigerschmidt & Prinz. *Anticipation of forthcoming strokes is more accurate for self-generated trajectories.* (47)

13:55–14:15 Bogaerts & Swinnen. *The bimanual production of drawing patterns with spatial incompatibilities.* (8)

14:20–14:40 De Maeght, Knuf & Prinz. *Ideomotor action—A new chapter.* (16)

14:45–15:15 *Coffee break*

Afternoon. Room B: Cognition I

Chair: Pohl

15:15–15:35 Towse, Redbond, Price & Cook. *On the temptation to break the rules: Can preschoolers cope?* (100)

15:40–16:00 Buchner. *Negative priming in temporal order judgements about auditory stimuli.* (11)

16:05–16:25 Los. *Classical conditioning as a basis for human timing processes.* (57)

Late Afternoon. Poster Session I

Evening. Room A: Plenary Keynote Lecture

Chair: Vandierendonck

18:00–19:00 Meyer & Kieras. *Executive-Process Interactive Control (EPIC): A cognitive architecture for comprehensive precise computational modeling of human multiple-task performance in laboratory and real-world contexts.* (K-2)

Afternoon. Room C: Symposium Visuo-spatial working memory (S-50)

Chair: Zimmer & Mohr

13:30–13:50 Logie. *Cache-ing in on working memory: The case of mental synthesis.* (S-51)

13:55–14:15 Quinn & McConnell. *The characteristics of information in visual working memory.* (S-52)

14:20–14:40 Zimmer & Speiser. *What is spatial in the visuo-spatial working memory?* (S-53)

14:45–15:15 *Coffee break*

15:15–15:35 Mecklinger, Bosch & Grünewald. *What are the modules? fMRI studies on visual working memory.* (S-54)

15:40–16:00 Mohr. *Spatial marking deficit as a consequence of hypoxic brain damage: A single case study.* (S-55)

16:05–16:25 Greenlee, Reinvang, Magnussen & Kraemer. *Neocortical areas underlying visual short-term memory: Evidence from fMRI.* (S-56)

Late Afternoon. Poster Session I

Evening. Room A: Plenary Keynote Lecture

Chair: Vandierendonck

18:00–19:00 Meyer & Kieras. *Executive-Process Interactive Control (EPIC): A cognitive architecture for comprehensive precise computational modeling of human multiple-task performance in laboratory and real-world contexts.* (K-2)

Afternoon. Room D: Symposium Estimating duration: directions for future research (S-22)

Chair: De Vooght & Franssen

13:30–13:50 Wearden. *Some new directions in scalar timing research with humans.* (S-23)

13:55–14:15 Burle, Casini, Macar & Vidal. *Activation and attention in time estimation: Electroencephalographic and behavioral studies.* (S-24)

14:20–14:40 Pouthas. *The role of timing mechanisms, attention and memory processes in the evolution of time estimation with age.* (S-25)

14:45–15:15 *Coffee break*

15:15–15:35 Brown & Bennett. *Automaticity and interference in concurrent temporal and nontemporal processing.* (S-26)

15:40–16:00 Dutke. *Remembered duration: Coordinative demands on working memory and the reproduction of intervals.* (S-27)

16:05–16:25 Michon. *Mental models of time.* (S-28)

Late Afternoon. Poster Session I

Evening. Room A: Plenary Keynote Lecture

Chair: Vandierendonck

18:00–19:00 Meyer & Kieras. *Executive-Process Interactive Control (EPIC): A cognitive architecture for comprehensive precise computational modeling of human multiple-task performance in laboratory and real-world contexts.* (K-2)

1.5 FRIDAY

Morning. Room A: Symposium Bilingual Lexical Processing (S-29)

Chair: Grainger

08:45–09:05 Léwy & Grosjean. *BIMOLA: A connectionist model of bilingual spoken word recognition.* (S-30)

09:10–09:30 Dijkstra & van Heuven. *Recognition of cognates and interlingual homographs: The neglected role of phonology.* (S-31)

09:35–09:55 Frenck-Mestre, Grainger, Bueno & Schuller-Guillo. *Rapid semantic activation of the lexicon in bilinguals.* (S-32)

10:00–10:30 *Coffee break*

10:30–10:50 Sanchez-Casas & Garcia-Albea. *Cross-language morphological effects: Some evidence from Catalan-Spanish bilinguals.* (S-33)

10:55–11:15 De Groot. *Lexical decision, word naming, and perceptual identification in the native and a foreign language.* (S-34)

11:20–11:40 Kroll, Dijkstra, Janssen & Schriefers. *Cross-language lexical activity during production: Evidence from cued picture naming.* (S-35)

Morning. Room B: Symposium Executive Functions (S-8)

Chair: Hommel

08:45–09:05 Allport & Wylie. *Task-switching costs without an immediate shift of task: Long-term negative priming (or negative transfer) between competing S-R mappings in Stroop tasks.* (S-9)

09:10–09:30 De Jong. *From task-switching to cognitive control.* (S-10)

09:35–09:55 Dreisbach, Haider & Kluwe. *The role of probability cues on task preparation as part of executive control processes.* (S-11)

10:00–10:30 *Coffee break*

10:30–10:50 Hommel & Eglau. *Permanent and transient links in the control of stimulus-response translation.* (S-12)

10:55–11:15 Mayr. *Characteristics of task-set inhibition.* (S-13)

11:20–11:40 Monsell, Yeung & Azuma. *The contribution of negative priming of task-set to the cost of switching tasks.* (S-14)

Morning. Room C: Long-Term Memory I

Chair: Helstrup

08:45–09:05 Vernon & Lloyd-Jones. *Implicit and explicit tests of memory for natural objects.* (107)

09:10–09:30 Marchal & Nicolas. *The picture bizarrenes effect: An example of distinctiveness in exPLICIT AND imPLICIT MEMORY.* (60)

09:35–09:55 Kowalczyk. *Impaired recall of words related to demands of a problem solved prior to encoding.* (49)

10:00–10:30 *Coffee break*

10:30–10:50 Nevers & Versace. *Contributions of studies about the frequency effects in the processes of activation and long-term conservation of episodic memory traces.* (67)

10:55–11:15 Rossi-Arnaud, Turella & Verrocchio. *Children's memory for events: The influence of familiarity and presentation mode.* (83)

11:20–11:40 Olivetti Belardinelli & Rossi-Arnaud. *Recollection and familiarity in recognition memory for musical themes.* (70)

Morning. Room D: Symposium Deductive reasoning, strategies and individual differences (S-36)

Chair: Schaeken

08:45–09:05	Capon, Handley & Dennis. *Working memory and individual differences in syllogistic and spatial reasoning.* (S-37)
09:10–09:30	Mackiewicz. *When the number of cases counts—A study on probabilistic factors in picture-sentence verification task.* (S-38)
09:35–09:55	Monaghan. *Learning style and constraining the language: Individual differences in solving syllogisms.* (S-39)
10:00–10:30	*Coffee break*
10:30–10:50	Roberts. *Strategies in relational inference.* (S-40)
10:55–11:15	Carriedo, Garcia-Madruga, Moreno & Gutiérrez. *How does the content affect conditional reasoning with different formulations? The case of warning and threats.* (S-41)
11:20–11:40	Schaeken. *Spatial reasoning, strategies and individual differences.* (S-42)

Afternoon. Room A: Speech Perception

Chair: Frauenfelder

13:30–13:50 Tabossi, Collina, Mazzeti & Sbisa. *Lexical access in spoken Italian is syllable based?* (97)

13:55–14:15 Peperkamp, Dupoux & Sebastien. *The perception of stress by French-Spanish bilinguals.* (73)

14:20–14:40 Spinelli, Segui & Radeau. *Phonological priming in spoken word recognition with bisyllabic targets.* (93)

14:45–15:05 Goetry, Kolinsky, Mousty & Morais. *Rhythmic cues used for speech segmentation in French and Dutch: the role of stress.* (29)

15:10–15:40 Coffee break

15:40–16:00 Fougeron, Frauenfelder & Content. *Is there an acrobat in nacrobat: How to juggle with boundary misalignement?* (25)

16:05–16:25 Frauenfelder, Banel & Perruchet. *The contribution of metrical cues to the acquisition of an artificial language.* (26)

16:30–16:50 Bachmann, Andersen & MacDonald. *Hearing by eye: How much spatial degradation can be tolerated?* (1)

Evening. Room A. Plenary Keynote Lecture

Chair: Brysbaert

17:15–18:30 Dehaene. *Contributions of brain-imaging to the cognitive neuroscience of number processing.* (K-3)

Evening. Room A. Business Meeting

Afternoon. Room B: Attention

Chair: Theeuwes

13:30–13:50 Cohen & Shoup. *Feature integration and object recognition: Different visual systems.* (14)

13:55–14:15 Kennedy. *Attention allocation in reading: Sequential or parallel?* (43)

14:20–14:40 Chorev & Henik. *Selectivity in selective attention.* (13)

14:45–15:05 Bekkering & Pratt. *Is attention object-based for non-spatial responses but spatial-based for aiming movements?* (5)

15:10–15:40 Coffee break

Room B: Visual Attention

Chair: Theeuwes

15:40–16:00 Lupiáñez & Ruz. *Disengaging of attention and inhibition of return.* (58)

16:05–16:25 Langton & Bruce. *You must see the point: Automatic processing of cues to the direction of social attention.* (52)

16:30–16:50 Mitterer, La Heij & van der Heijden. *Stroop dilution: Evidence for attention capture.* (66)

Evening. Room A. Plenary Keynote Lecture

Chair: Brysbaert

17:15–18:30 Dehaene. *Contributions of brain-imaging to the cognitive neuroscience of number processing.* (K-3)

Evening. Room A. Business Meeting

Afternoon. Room C: Long-Term Memory II

Chair: Wolters

13:30–13:50 Helstrup. *The elusive collaboration effect: What about memories of action events?* (37)

13:55–14:15 Pohl. *More than hindsight bias: Systematically distorted recall of the solutions of difficult knowledge questions.* (76)

14:20–14:40 Tversky & Marsh. *Talking about your life: how to distort your own memory?* (102)

14:45–15:05 Yonker, Herlitz & Nilsson. *Postmenopausal estrogen use and memory performance.* (115)

15:10–15:40 *Coffee break*

15:40–16:00 Bucks & Conway. *Directed forgetting in probable Alzheimer's disease: Failure to find failure of inhibition.* (12)

16:05–16:25 Baddeley, Vargha-Khadem & Mishkin. *Developmental amnesia: Implication for the structure of LTM.* (2)

16:30–16:50 Smith. *A jigsaw puzzle theory of memory.* (91)

Evening. Room A. Plenary Keynote Lecture

Chair: Brysbaert

17:15–18:30 Dehaene. *Contributions of brain-imaging to the cognitive neuroscience of number processing.* (K-3)

Evening. Room A. Business Meeting

Afternoon. Room D: Thinking and Reasoning

Chair: Storms

13:30–13:50 McCloy & Byrne. *Temporal order effects in counterfactual and semifactual thinking about what might have been.* (62)

13:55–14:15 Dierckx & Vandierendonck. *Model construction strategies in linear temporal reasoning.* (19)

14:20–14:40 Schroyens, Schaeken & d'Ydewalle. *Mental models, rules and biases in conditional reasoning with negations.* (89)

14:45–15:05 Keinath & Krems. *The influence of anomalous data on solving human abductive tasks.* (41)

15:10–15:40 Coffee break

15:40–16:00 Green. *Understanding microworlds.* (31)

16:05–16:25 Saariluoma. *Apperception and search in complex problems.* (86)

16:30–16:50 Nückles & Bromme. *Experts reasoning about communication with laymen: Web-experiments.* (69)

Evening. Room A. Plenary Keynote Lecture

Chair: Brysbaert

17:15–18:30 Dehaene. *Contributions of brain-imaging to the cognitive neuroscience of number processing.* (K-3)

Evening. Room A. Business Meeting

1.6 SATURDAY

Morning. Room A: Visual Word Recognition II

Chair: Vonk

08:45–09:05 Lemhöfer & Radach. *Selective effects of language context on word processing in bilinguals.* (56)

09:10–09:30 Torres, Rodríguez-Santos, Garcia Orza & Santana. *Written word processing in deaf and hearing Spanish people.* (99)

09:35–09:55 Transler, Gombert & Leybaert. *Complex graphemic units in lexical decision in deaf children.* (101)

10:00–10:30 *Coffee break*

10:30–10:50 Sandra, Geudens & Taelman. *Onsets and rime units in the reading process of beginning Dutch readers.* (87)

10:55–11:15 Havelka & Frankish. *Phonological and visual factors in visual word recognition.* (36)

11:20–11:40 Tzelgov, Baron & Yehene. *Automatic reading is not constrained to the direct route.* (103)

Morning. Room B: Task Switching

Chair: Monsell

08:45–09:05 Hagendorf, Fischer, Grattenthaler & Voigt. *Repetition and alternation between mental transformations.* (33)

09:10–09:30 Kleinsorge, Heuer & Schmidtke. *Generalization of cognitive switching operations.* (46)

09:35–09:55 Pösse & Hommel. *The role of task relevant and irrelevant dimensions in task switching.* (77)

10:00–10:30 Coffee break

10:30–10:50 Vandierendonck, Caessens, De Vooght & Van der Goten. *Effects of task-set size on switching costs.* (104)

10:55–11:15 Ridderinkhof. *Cognitive control and the costs of task shifting: Do shift costs pertain to task preparation or to task performance?* (81)

11:20–11:40 Oomen & Postma. *Effects of divided attention on speech monitoring.* (71)

Morning. Room C: Symposium Numerical Cognition (S-15)

Chair: Fias & Brysbaert

08:45–09:05 Lochy. *From twelve hundred to 1200: A temporal, spatial and kinematic analysis of the handwriting of Arabic numerals as a function of the lexical and syntactic structure of the verbal input form.* (S-16)

09:10–09:30 Fias, Brysbaert, Lauwereyns & d'Ydewalle. *The functional locus of magnitude information and some properties of the processes giving access to it.* (S-17)

09:35–09:55 Willmes, Kemeny, Weis & Pollrich. *Number parity and the mental number line—an fMRI study* (S-18)

10:00–10:30 *Coffee break*

10:30–10:50 Thioux. *The supervisory attentional system, contention scheduling and the transcoding of numerals in Alzheimer's disease.* (S-19)

10:55–11:15 LeFevre, Lei & Mullins. *Arithmetic by eye an by ear.* (S-20)

11:20–11:40 Lemaire, Lecacheur, Farioli & Duverne. *A life-span study of strategy choices in computational estimation.* (S-21)

Morning. Room D: Visual Perception

Chair: Bruce

08:45–09:05 Kerzel. *The role of eye movements in judged displacement of a moving target.* (44)

09:10–09:30 Verfaillie, De Graef & Gysen. *Implicit transsaccadic memory for saccade source and target.* (105)

09:35–09:55 Jüttner & Rentschler. *Functional 'tunnel vision' in pattern classification learning.* (40)

10:00–10:30 *Coffee break*

10:30–10:50 Gellatly, Cole & Blurton. *Factors affecting accuracy and speed of search amongst new and old objects.* (27)

10:55–11:15 Leder. *Looking at you! The role of relational features in face perception.* (55)

11:20–11:40 Rouw & de Gelder. *Two kinds of configural processing: Developmental and neuropsychological studies.* (85)

Afternoon. Room A: Visual Word Recognition III

Chair: Lupker

13:30–13:50 Lange & Content. *Is print-to-sound conversion based on rules?* (51)

13:55–14:15 Perea & Carreiras. *The effects of syllable neighborhood in reading, lexical decision and identification tasks.* (74)

14:20–14:40 Giraudo & Grainger. *A supralexical model of morphological processing in French.* (28)

14:45–15:05 Laudanna & Caramazza. *Orthographic vs. morphemic factors in inhibitory priming during word recognition.* (54)

15:10–15:30 Meunier & Marslen-Wilson. *Inflectional morphology in the French mental lexicon.* (65)

Afternoon. Poster Session II

Evening. Room A: Young Psychologist Lecture

Chair: Bruce

17:15–18:15 Brandimonte. *Prospective memory and automaticity.* (K-4)

Afternoon. Room B: Symposium Functional aspects of visual attention (S-43)

Chair: Kunde & Hoffmann

13:30–13:50 Schneider. *Selective visual attention: Three basic control processes.* (S-44)

13:55–14:15 Theeuwes, Kramer & Atchley. *Spatial attention in early vision.* (S-45)

14:20–14:40 Gomez Milan & Tornay. *Automatic orienting of spatial attention and mental set.* (S-46)

14:45–15:05 Müsseler. *Space perception and attentional shifts.* (S-47)

15:10–15:30 Hoffmann & Kunde. *The adaptation of visual attention to covariations of objects and locations.* (S-48)

Afternoon. Poster Session II

Evening. Room A: Young Psychologist Lecture

Chair: Bruce

17:15–18:15 Brandimonte. *Prospective memory and automaticity.* (K-4)

Afternoon. Room C: Cognition II

Chair: Smith

13:30–13:50 Larsen, Bundesen, Kyllingsbæk & Law. *Brain activation during mental transformation of size.* (53)

13:55–14:15 Ratinckx, Brysbaert & Reynvoet. *Bilateral field interactions in number processing.* (80)

14:20–14:40 Vernier & Koenig. *Effect of stimulus identification and distance variation on the right hemisphere advantage for the processing of coordinate spatial relations.* (106)

14:45–15:05 Brennen, Martinussen, Hansen & Hjemdal. *Arctic cognition: A study of cognitive performance in summer and winter at 69 degrees N.* (10)

15:10–15:30 Wohlschläger, Bekkering & Gattis. *Imitation in young children: mapping means or mapping ends?* (113)

Afternoon. Poster Session II

Evening. Room A: Young Psychologist Lecture

Chair: Bruce

17:15–18:15 Brandimonte. *Prospective memory and automaticity.* (K-4)

Afternoon. Room D: Symposium From Ptolemy to Psychology: Constraints on Interpreting Spatial Representations (S-64)

Chair: Gattis

13:30–13:50 Klippel. *Localization constraints in schematic and topographic maps.* (S-65)

13:55–14:15 Vorwerg. *Graphical user interfaces and perceptual constraints.* (S-66)

14:20–14:40 Shevelan. *Preschool children's understanding of spatial representations.* (S-67)

14:45–15:05 Gattis & Molyneaux. *Perceptual and linguistic polarity constrain reasoning with spatial representations.* (S-68)

15:10–15:30 Tversky *Discussion.*

Afternoon. Poster Session II

Evening. Room A: Young Psychologist Lecture

Chair: Bruce

17:15–18:15 Brandimonte. *Prospective memory and automaticity.* (K-4)

1.7 POSTER SESSION I: THURSDAY 16:30

- Alario, Segui & Matos. *Syntactic congruency in word and picture naming.* (PI-1)
- Bonin, Peereman & Fayol. *Accessing the mental lexicon in written picture naming: Do phonological codes constraint the selection of orthographic codes?* (PI-2)
- Chanquoy & Negro. *The agreement of the past participle in number and gender in written French. A developmental study from 7th to 12th grade.* (PI-3)
- Franck, Collina & Vigliocco. *Gender agreement in language production II: When morpho-phonology hits syntax.* (PI-4)
- Frisson, Sandra & Daems. *The influence of homophone frequency and distance in spelling regular Dutch verbs.* (PI-5)
- Lainé & Iralde. *Children idiomatic expressions processing.* (PI-6)
- Maillart & Schelstraete. *How are adults of low literacy advantaged or disadvantaged in learning to read and to spell?* (PI-7)
- Pacton, Fayol & Perruchet. *Implicit learning of morphology and graphotactic regularities affect children's and adults' judgments of nonwords.* (PI-8)
- Rummer & Schrobildgen. *Immediate recall of auditorily presented sentences is based on phonological representations.* (PI-9)
- Vinson & Vigliocco. *Explaining noun-verb dissociations: A system of feature-based lexical representation.* (PI-10)
- Branigan, Pickering & Cleland. *Coordination of syntactic structure in dialogue.* (PI-11)
- Colonna, Mitchell & Pynte. *Evidence against aspects of Frazier and Clifton's construal theory.* (PI-12)
- Dupont & Bestgen. *Structure and topic information in expository text overviews.* (PI-13)

- Garcia Orza & Rodríguez-Santos. *The effect of repeated exposure to syntactic structures in the resolution of syntactic ambiguities.* (PI-14)
- Hahne & Friederici. *Semantic and syntactic processes in auditory sentence comprehension: Evidence from event-related brain potentials.* (PI-15)
- Hoeks, Vonk & Mak. *The difference between eyes and fingers: A method artefact in self-paced reading experiments.* (PI-16)
- Lavigne-Tomps, Vitu & d'Ydewalle. *Locus of context effects in sentence reading: Semantic effects on the initial eye landing position in words.* (PI-17)
- Schmitt, Muente & Kutas. *The time course of semantic and syntactic encoding during language production estimated by ERP (event related potentials).* (PI-18)
- Baddeley, Baddeley, Bucks & Wilcock. *Alzheimer disease, task switching and the fractionation of working memory.* (PI-19)
- De Rammelaere, Stuyven & Vandierendonck. *Solving simple mental arithmetic sums and products: Contribution of the central executive but not of the phonological loop.* (PI-20)
- Eenshuistra, Wagenmakers, & De Jong. *Age-related strategy differences in task-switching.* (PI-21)
- Groborz. *Cognitive control, generation and evaluation skills and creative process.* (PI-22)
- Gruszka. *The relationships between spreading activation, cognitive inhibition and divergent thinking.* (PI-23)
- Nieuwenhuis, Ridderinkhof, van der Molen & Kok. *Age-related differences in the antisaccade task.* (PI-24)
- Orzechowski. *Beyond Sternberg's components: Sequential versus parallel processing in analogical reasoning.* (PI-25)
- Piotrowski. *Convergent task and divergent task and working memory. Measuring activity of central executive system by means of random generation of time intervals.* (PI-26)

- Van den Wildenberg & van der Molen. *Response stopping during tonic inhibition.* (PI-27)
- Verté, Roeyers & Geurts. *Executive functioning and right-hemispherical dysfunctions in children with autism and Asperger's syndrome.* (PI-28)
- Vieillard & Bougeant. *Effect of emotional state on executive control in working memory.* (PI-29)
- Vigneau, Dauvier & Juhel. *Speeded performance and the control of action: A study of individual differences.* (PI-30)
- Waszak & Hommel. *Task-switching: Proactive inhibition of competitive task-sets.* (PI-31)
- Brass & Bekkering. *Response competition in a simple response task.* (PI-32)
- Caessens. *Does a central inhibitory mechanism operate through action-effect inhibition?* (PI-33)
- Drewing, Miedreich & Aschersleben. *The influence of acoustic feedback on bimanual tapping.* (PI-34)
- Ghyselinck. *The power of strategic processes in action-planning.* (PI-35)
- Louvegnez & Koenig. *Priming and motor imagery.* (PI-36)
- Müller, Aschersleben, Schmitz, Schnitzler, Freund & Prinz. *A neuromagnetic view on the role of modality in sensorimotor synchronization.* (PI-37)
- Aumont & Boujon. *Capacity of working memory: Is the visuo-spatial sketchpad more automatic than the phonological loop?* (PI-38)
- Ciccarelli, Arduino, De Vincenzi, Job, D'Alessio & Schimmenti. *A word span test for Italian children.* (PI-40)
- Moleux & Ehrlich. *Working memory and language comprehension in mentally retarded adolescents.* (PI-41)
- Monnier & Roulin. *Activation and working memory in children.* (PI-42)

- Postal, Castano & Charles. *Skilled performance in soccer: Hypothesis of long-term working memory.* (PI-43)
- Thibaut & Comblain. *Learning new names for new stimuli: Making the connection.* (PI-44)
- Dab, Lilet & Frith. *Heterogeneous patterns of cognitive impairments in schizophrenic patients producing confabulation.* (PI-45)
- Gauthier & Le Boued. *Research of processes involved in directed forgetting, method item by item, at young and old adults through a manipulation of processing.* (PI-46)
- Martens & Wolters. *Interference in implicit memory due to processing interpolated material.* (PI-47)
- Olofsson & Ohta. *Age-related effects on hypermnesia.* (PI-48)
- Poznanski & Tzelgov. *Cross-modal transfer in artificial grammar learning.* (PI-49)
- Baumann & Krems. *Working memory processes in abductive reasoning.* (PI-50)
- Buehner. *Predictive and diagnostic learning: Is one more fundamental than the other?* (PI-51)
- Burrieza, Torres, Ramos & Márquez. *Logtest: A tool for evaluation and learning of the use of logical connectives in sentences.* (PI-52)
- Dieussaert, Schaeken, De Neys & d'Ydewalle. *Initial belief state as predictor of belief revision.* (PI-53)
- Osman. *Individual differences in three reasoning tasks.* (PI-54)
- van der Henst & Johnson-Laird. *Strategies in reasoning and production task.* (PI-55)
- Verschueren, Schroyens, Schaeken & d'Ydewalle. *Implicit affirmation and denial in conditional reasoning with negations.* (PI-56)
- Walsh & Byrne. *Reasons for acting in counterfactual thinking.* (PI-57)

- Antrop & Roeyers. *Hyperactive behaviour in children with Attention Deficit Hyperactivity Disorder (ADHD) explained by the delay aversion hypothesis.* (PI-58)
- Clément & Darcheville. *Nonlinear dynamics of temporal control in children.* (PI-59)
- Di Matteo & Olivetti Belardinelli. *Time estimation of temporally structured auditory events.* (PI-60)
- Droit-Volet & Gautier. *Attention and estimation of time in young children.* (PI-61)
- Franssen. *Timing and interference with concurrent nontemporal tasks: General attentional resources or specialized processing?* (PI-62)
- Lemercier & Boujon. *Facilitation effect on congruent naming: Does inadvertent reading exist?* (PI-63)

1.8 POSTER SESSION II: SATURDAY 15:40

- Colin & Radeau. *Audiovisual integration in speech and in spatial scene analysis: A comparison.* (PII-1)
- Colomé & Schriefers. *Phonological activation of the non-target language: Does it depend on bilinguals' proficiency?* (PII-2)
- Dissard, Holden & Van Orden. *Nonlinearity of the speech/nonspeech boundary.* (PII-3)
- Dumay, Frauenfelder & Content. *Acoustic-phonetic cues to word boundaries in French consonant clusters.* (PII-4)
- Anaki & Henik. *Effect of cognitive load and its timing on semantic priming.* (PII-5)
- Arduino & Burani. *Neighborhood size and frequency: Effects on pseudoword visual processing.* (PII-6)
- Ballaz, Marendaz & Valdois. *Syllables as visual units: Evidence from dyslexic and deaf children.* (PII-7)
- Belier & Koenig. *Syllabic units in the cerebral hemispheres: Evidence from a lateralized priming experiment.* (PII-8)
- Chéreau, Halle & Segui. *Interactions between phonological and orthographic codes in the processing of print.* (PII-9)
- Delord. *Prime processing in the so-called unconscious semantic priming paradigm.* (PII-10)
- De Moor, Ghyselinck & Brysbaert. *Age of acquisition norms for Dutch words.* (PII-11)
- Desmet & Brysbaert. *The value of the letter search task for visual word recognition.* (PII-12)
- Lo Priore & Brennen. *Top-down influences on the reading of proper names.* (PII-13)
- Nisslein, Müsseler & Koriat. *Orthographic word shape in German and the missing-letter effect.* (PII-14)

- Peereman & Dubois Dunilac. *Lexical neigbourhood and frequency of print-to-sound associations in printed word naming.* (PII-15)

- Smolka & Eviatar. *The effects of diacritics on visual word recognition in Hebrew: Differential processing in the left and right cerebral hemispheres.* (PII-16)

- van Heuven, Dijkstra, Grainger & Schriefers. *Shared neighborhood effects in masked orthographic priming.* (PII-17)

- von Studnitz & Green. *Dynamic control of interlingual homograph interference in bilinguals.* (PII-18)

- Borg & Bougeant. *Attentional bias associated with anxiety states: Effects of inhibitory mechanisms.* (PII-19)

- Gael & Versace. *Negative priming in a gender decision task without prime or target selection.* (PII-20)

- Lemoine, Lemercier & Boujon. *The effects of training on negative priming and Stroop tasks with 3 perceptual dimensions (3D).* (PII-22)

- Madrid, Tudela & Lupiáñez. *Electrophysiological indices of visuo-spatial attention with the geodesic dense array sensor net.* (PII-23)

- Raffone & Olivetti Belardinelli. *Feature binding at different processing levels: Relational vs. activation coding in cognition.* (PII-24)

- Rodríguez-Santos & Calleja-Reina. *Associative negative priming in the visual identification of words.* (PII-25)

- Rueda & Tudela. *Effect of attending vs. ignoring distracting semantic information in a Stroop task.* (PII-26)

- D'Hondt & Leybaert. *Cerebral lateralization for speech production in deaf people exposed to cued speech.* (PII-27)

- Ginchereau, Koenig, Thomas-Antérion & Laurent. *Evidence for different categorical judgment subsystems in patients with left-hemisphere lesions.* (PII-28)

- Padovan, Antérion, Versace & Laurent. *Emotional information processing: Evidence for a dissociation between pathways mediating positive and negative informations in Alzheimer type patients.* (PII-29)
- Sander & Koenig. *Separate subsystems for the processing of negative and positive emotional visual stimuli.* (PII-30)
- Baudouin & Tiberghien. *Gender is a key to face recognition.* (PII-31)
- Pourtois, de Gelder, Vroomen & Rossion. *Face Inversion modifies an electrophysiological correlate of multimodal emotional perception.* (PII-32)
- Rossion, Robaye, Linotte & Bruyer. *Is gender processing from face really parallel to face recognition?* (PII-33)
- Seitz, Limmer & Schumann-Hengsteler. *Aspects of person recognition: Preschoolers, school children and adults identification.* (PII-34)
- Dekeyser, Van Rie & Verfaillie. *Exploring the oscillation effect with point light walkers.* (PII-35)
- Germeys, De Graef & Verfaillie. *Representational systems in transsaccadic object perception.* (PII-36)
- Van Zandvoort & Puts. *The influence of chromatic and luminance background on form detection.* (PII-37)
- Fournet & Monnier. *Visuo-spatial working memory: Experimental and developmental fractionation.* (PII-38)
- Knuf & Hommel. *Spatial cognition: Functional determinants of spatial coding in perception and memory.* (PII-39)
- Pazzaglia & De Beni. *Role of visuospatial working memory and spatial representation in way-finding.* (PII-40)
- Reymond & Roulin. *Localization tasks and visuospatial short-term memory.* (PII-41)
- Russier & Magnan. *Organizing principle in blind and sighted children's drawings of embedded geometric shapes.* (PII-42)

- Thys, Germeys & d'Ydewalle. *Identifying spatial relations between objects in a scene.* (PII-43)
- Vecchi, Bardone & Rossi. *The "Corsi" task (visuo-spatial span) and working memory components: Methodological and theoretical issues.* (PII-44)
- Zoelch & Schumann-Hengsteler. *Determinants of complexity in a sequential, visuo-spatial short-term memory task.* (PII-45)
- Girelli, Lucangeli & Butterworth. *The rise of automaticity in accessing number magnitude.* (PII-46)
- Lemer, Leybaert & Content. *The involvement of short-term memory in multi-digit additions: Evidence from a dual-task paradigm.* (PII-47)
- Luwel, Verschaffel, De Corte & Onghena. *Children's strategies for the estimation of numerosity in a two-dimensional environment.* (PII-48)
- Reynvoet & Brysbaert. *Do single and two-digit numbers make access to the same analogue magnitude scale?* (PII-49)
- Thevenot. *Arithmetic problem solving and memorization of number facts.* (PII-50)
- Bedoin. *Cognitive mechanisms in the distinctiveness effect.* (PII-51)
- Bett-Martin, Hoffmann & Moser. *Learning of statistical structures in sequences of stimuli and reactions: Same or different mechanisms?* (PII-52)
- Boyer & Cleeremans. *Artificial grammar learning under time pressure.* (PII-53)
- Costermans. *Activation spreading in taxonomic structures: The central position of basic-level concepts.* (PII-54)
- Honoré, Boyer & Bedoin. *Ontological organisation in the distinctiveness effect.* (PII-55)
- Kossowska. *Cognitive determinants of political beliefs.* (PII-56)
- Lowenthal. *Nim game strategies in 9-, 10- and 11-year olds.* (PII-57)

- Marcourt. *Cognitive observations in a Logo problem solving environment.* (PII-58)
- Müller. *Transformation knowledge: Influences on the flexibility of its use.* (PII-59)
- Simons & Bredart. *Effect of species and group size context on subjects' risk attitudes in a 'life-death' decision problem.* (PII-60)
- Verstijnen & Wagemans. *Analogical problem solving and the aid of visual displays.* (PII-61)
- Pira-Menconi & Juan de Mendoza. *Hemispheric specialization and identification of words: influence of the perceptive indices.* (PII-62)

Chapter 2

KEY-NOTE LECTURES

[K-1] Word for word: Multiple lexical access in speech production.

Willem J. M. Levelt

You may well have produced your fifty-millionth word before your twenty-first birthday. Producing words is a core aspect of speaking, and speaking is one of our dearest occupations. Still, producing even a single word is a highly complex affair. In a recent target paper (BBS, 1999, 21, 1-38), Levelt, Roelofs and Meyer reviewed their theory of lexical access in speech production, which dissects the word producing mechanism as a staged application of various dedicated operations. Early in the process, the speaker activates a target lexical concept (for instance the concept of a table) and selects the corresponding syntactic word or 'lemma'. Subsequently, the speaker retrieves the target word's phonological code, which is used to rapidly syllabify the word (ta-ble). This is all preperatory to the word's actual articulation.
After presenting a bird's eye (re)view of the theory, I will square the complexity by asking how you control multiple access in generating utterances such as a table and a chair. How much temporal overlap of stages does the system tolerate in accessing multiple content words, such as table and chair? And what happens in an anaphoric expression, such as the table, it fell over, where you make repeated reference to the same entity, though by a different word? New evidence from speech onset latency and eye tracking experiments begins to tell us an exciting story.

Max Planck Institute for Psycholinguistics, Wundtlaan 1, NL-6525 XD Nijmegen, The Netherlands

[K-2] Executive-Process Interactive Control (EPIC): A cognitive architecture for comprehensive precise computational modeling of human multiple-task performance in laboratory and real-world contexts.

David E. Meyer
David E. Kieras

Some previous leaders of cognitive science and experimental psychology have suggested that these scientific disciplines will progress most successfully and quickly through efforts to develop unified theories of cognition and action based on general architectures for computational modeling (e.g., Newell, 1973, 1990; J. Anderson, 1976). Following this suggestion, we have formulated the Executive-Process Interactive Control (EPIC) architecture and have used it as a basis for computational modeling of human multiple-task performance (Kieras & Meyer, 1997, 1999; Meyer & Kieras, 1997, 1999). EPIC has component software modules that emulate basic perceptual, cognitive, and motor information processing during skilled procedural cognition and action. Computational models based on EPIC fit well with quantitative data from a variety of task situations, including both prominent laboratory paradigms such as the psychological refractory period (PRP) procedure and realistic contexts such as simulated aircraft cockpit operation. From constructing EPIC models and fitting them to data, numerous insights have been reached into the nature of human information processing and executive mental control. Such insights help characterize how people select and use adaptive control strategies to coordinate the performance of multiple concurrent tasks while satisfying task requirements and coping with limited perceptual-motor capacities. This characterization eventually may yield significant payoffs in practical applications related to human-factors engineering, personnel selection, and skill acquisition. The potential benefits of EPIC computational modeling illustrate how progress toward unified theories of cognition and action may advance experimental psychology and cognitive science.

Department of Psychology, University of Michigan, 2030 Devolson, Ann Arbor, MI 48104, USA

[K-3] Contributions of brain-imaging to the cognitive neuroscience of number processing.

Stanislas Dehaene

Can brain imaging techniques contribute to resolve controversies in cognitive science? In the domain of number processing, competing theories disagree on the relation between arithmetic and language processing, the role of semantic information, and the possibility of accessing semantics unconsciously. Three new brain-imaging experiments that address these issues will be reported. The first experiment identifies the intraparietal sulcus as a major activation during the semantic processing of numerical quantity, with a variable pattern of lateralization for different arithmetic operations (addition, subtraction, comparison). The second experiment reveals striking differences in behavior and cerebral activation patterns during exact versus approximate calculation, with bilateral parietal involvement during approximation and engagement of left-lateralized language networks during exact calculation. The third experiment reveals that a very simple arithmetic task, number comparison, can be performed in a subliminal mode.

Together, these new results stress that specific cerebral networks, partially distinct from language networks, are implicated in number processing and can be recruited either voluntarily or unconsciously. In particular, the inferior parietal lobule plays a specific role in mental arithmetic. Number processing can proceed unconsciously when the task is very simple (e.g. comparing two numbers), and in that case little or no prefrontal or cingulate activity is observed. During more complex and effortful tasks, however, such as mental subtraction, the parietal cortex is activated in coordination with anterior cingulate and prefrontal cortical networks.

INSERM U 334, Service Hospitalier Frederic Joliot, CEA/DRM/DSV, 4 Place du general Leclerc, F-91401 Orsay cedex, France

[K-4] Prospective memory and automaticity.

Maria A. Brandimonte

Recent advances in the study of prospective memory suggest that prospective memory retrieval relies on both automatic and controlled processes. In the present lecture, latest empirical and theoretical developments in the area will be reviewed. Current models of the interaction between automatic and strategic components of memory for delayed intentions are not sufficient to serve as a unified framework for explaining the results obtained so far, mainly because these models were derived from memory theories developed for other purposes. A specific model of the interaction between automatic and strategic components of prospective memory retrieval is, therefore, needed. Preliminary ideas on this question will be presented.

Department of Psychology, University of Trieste, Via degli Universita 7, I-34123 Trieste, Italy

Chapter 3

SYMPOSIA

[S-1] SYMPOSIUM
LANGUAGE PRODUCTION: ENCODING PROCESSES, AND REPRESENTATIONS.

Pienie Zwitserlood

Institut für Allgemeine und Angewandte Psychologie, WWU Münster, Fliednerstrasse 21, D-48149 Münster, Germany

Language production proceeds from conceptual levels of message planning to the eventual articulation of speech sounds. Of course, many processes intervene. Central questions in language production are whether such processes are serially ordered, to what extent processing is incremental, and which information is available at which level of encoding. In their contribution, La Heij and Starreveld challenge serial ordering, as proposed by Levelt and his co-workers (cf. Levelt, Roelofs, & Meyer, BBS, in press), of the lemma and lexeme level. Models are explicit as to which information is available at which level. Lemmas contain syntactic properties of words, lexemes are phonological specifications of a word's form (Kempen & Huybers, 1983; Levelt, 1989; Levelt et al., in press). Pechmann investigates whether lexical-syntactic information is available at the lemma level, and Jescheniak et al. do the same for information about a word's gender. Bölte et al. are concerned with the origin—at conceptual, lemma and lexeme levels—of effects of morphological relatedness. At a different stratum, the generation of the grammatical structure of utterances, Timmermans et al. report data on the incrementality of utterance production. How does the temporal availability of conceptual information influence the syntactic format of an utterance? Olsthoorn and Kempen take a different perspective, addressing the often neglected question as to whether processing mechanisms and representations are shared between language production and comprehension. They investigate the single vs. dual processing architecture at the level of grammatical encoding.

[S-2] Phonological facilitation in gender decision.

Wido La Heij
Peter A. Starreveld

According to strict serial two-stage models of word production, the formulation of a picture's name involves two stages, lemma selection and word-form encoding. This process can be studied in the picture-word task, in which participants name pictures and ignore accompanying words. Pictures are named faster when they are accompanied by phonologically related words than when they are accompanied by unrelated words. This phonological effect is assumed to be localized at the level of phonological encoding of the picture's name. In addition, Levelt, Roelofs & Meyer (in press) argued that only when the retrieval of the picture's lemma is delayed (e.g., when the distractor word is semantically related to the picture) the phonological facilitation effect is also localized at the lemma level. With this latter assumption, strict serial models can account for the interaction between semantic and phonological context effects as reported by Starreveld & La Heij (1995; 1996). However, from this assumption it follows that no phonological effects should be found at the lemma level when lemma retrieval is not delayed. This prediction was tested in a series of gender-decision tasks. Implications of our findings for models of language production will be discussed.

Department of Experimental and Theoretical Psychology, Leiden University, P.O. Box 9555, NL-2300 RB Leiden, The Netherlands

[S-3] Activation of syntactic information during speech production.

Thomas Pechmann

Accessing the lexicon is one of the central processes during the generation of speech. Depending upon prior conceptual planning the speaker must select in very short time those lexical items which express what she wants to convey. Empirical evidence of different kinds (speech errors, tip-of-the-tongue-phenomenon) supports the claim that lexical access takes place in two steps. First, the speaker activates so-called lemmata: lexical items which are semantically and syntactically specified. The phonological word-forms, so-called lexemes, are activated at the second stage. It has experimentally been demonstrated that the processing of semantic and phonological information does indeed occur at two consecutive stages. According to the two-stage theory of lexical access the same should hold for the activation of syntactic and phonological information. In order to test this assumption a variant of the picture-word interference paradigm has been used to study the time-course of syntactic information. The results obtained show that word-class information is activated during the same time-window at which semantic interference has usually been found. This is in line with the two-stage model.

Department of Linguistics, University of Leipzig, Augustplatz 9, D-04109 Leipzig, Germany

[S-4] The production of gender-marked pronouns.

Jorg D. Jescheniak
Herbert Schriefers
Ansgar Hantsch

Most models of lexical access in speaking hold that the retrieval of semantic-syntactic information (i.e., lemma information) and the retrieval of phonological information (i.e., wordform information) ought to be distinguished. In particular, the retrieval of a noun's grammatical gender is assumed to be mediated by access to the noun's lemma, but to be independent of the retrieval of the noun's phonological form. In a series of experiments we tested this claim by investigating the production of gender-marked pronouns in German, using a variant of the picture-word interference paradigm (cf., Schriefers, Meyer, & Levelt, 1990, JML). Participants named pictures of simple objects by producing the appropriate pronoun while ignoring auditory distractor words. If grammatical gender—needed in determining the form of the pronoun—is accessed from the noun's lemma, we expected interference from distractors semantically related to the object name. If the noun's word form is also activated when producing the pronoun, we additionally expected to find an effect from distractors phonologically related to the object name. In our experiments we observed semantic interference but there was no phonological effect. Thus, our data suggest that in generating pronouns, speakers reaccess the lemma of the corresponding noun, while its word form remains inactive.

Max Planck Institute for Cognitive Neuroscience, P.O. Box 500 355, D-04103 Leipzig, Germany

[S-5] The influence of tulips, robes, and roses on rose: Semantic, phonological, and morphological priming in speech production.

Jens Bölte
Pienie Zwitserlood
Petra Dohmes

Does morphological complexity matter in speech production? How are morphological complex words produced? There are models in which all morphologically complex words are constructed (e.g. Levelt, 1989). Others suggest that whether a complex word is stored or constructed depends on the type of morphological complexity (derivation and compounding vs. inflection, cf. Pinker & Prince, 1988) or on word frequency (Stemberger & MacWhinney, 1986). Finally, it was proposed that all morphological variants are stored separately (Butterworth, 1983). Despite the great diversity of models there are few attempts to experimentally approach these questions in speech production. This might be due to the fact that it is difficult to separate morphological from semantic and phonological effects. We present a paradigm which allows us to separate phonological and semantic effects from morphological effects in speech production. The paradigm is an adaptation of the long-lag repetition priming procedure used in word recognition research. Semantic and phonological effects, although present in picture-word interference experiments, are absent in the long-lag priming situation. In contrast, morphologically related picture-word pairs facilitate picture naming with the immediate picture-word paradigm as well as with long lagged priming. The results will be discussed with respect to the origin of the effect and the relevance for existing models.

Institute of Psychology II, University of Münster, Fliedner Strasse 21, D-48149 Münster, Germany

[S-6] Describing simple events: Experiments on incremental grammatical encoding.

Mark Timmermans
Herbert Schriefers
Simone Sprenger
Ton Dijkstra

Over the years, the view that speakers produce their utterances incrementally has become common ground in the psycholinguistic community (De Smedt, 1996; Kempen, 1978; Kempen & Hoenkamp, 1987; Levelt, 1989). On the modeling side, this notion has resulted in the formulation of several computational models, one of which is the Incremental Parallel Formulator (IPF; DeSmedt, 1996). A central prediction of this model is that the order and (relative) timing with which fragments of the conceptual input are activated exert an influence on the syntactic format of the eventual utterance. Although this model provides us with a number of predictions concerning utterance formats as a function of the (relative) timing with which conceptual fragments activate lexical segments, empirical evidence supporting this claim is scarce. In a series of four experiments, we tested predictions made by IPF directly by asking subjects to give verbal descriptions of simple computer animations in which two geometrical objects moved in upward and downward directions. In these experiments, the temporal availability of the identity of the objects, their complexity and the temporal availability of the movement direction of the objects was systematically manipulated. The results of the experiments are interpreted within the framework of IPF and confirm its predictions to a large extent. The results further impose both qualitative and quantitative constraints on the model with respect to the availability of conceptual fragments and its effect on the eventual sentence format speakers use.

Nijmegen Institute for Cognition and Information (NICI), University of Nijmegen, P.O. Box 9104, NL-6500 HE Nijmegen, The Netherlands

[S-7] The cognitive architecture of grammatical encoding and decoding: Evaluating the single-processor hypothesis using a picture-sentence interference test.

Nomi Olsthoorn
Gerard Kempen

Psycholinguists usually hypothesize that the distinction between syntactic processing modalities—grammatical encoding vs. grammatical decoding—is reflected in the cognitive architecture of the language faculty. However, traditional arguments in favor of this are unconvincing. Using an experimental paradigm based upon the picture-word interference task we explore the possibility of a single grammatical processor for both modalities. In the picture-sentence interference task we present subjects with lead-in fragments which have to be completed with a picture discription. The pictures depict intransitive actions performed by actors. Two types of lead-ins are used, requiring completion in either subject-verb or verb-subject word order. The to-be-produced word order was combined with the presentation of distractor sentences in either the same or a different word order. Systematic variation of the delay between presentation of the distractor and the picture allows determination of the time-course of grammatical processing in encoding and decoding. The single-processor model predicts interference between induced word order and distractor word order when both tasks simultaneously tap into the same grammatical processing resources. Facilitation is expected when encoding takes place shortly after having decoded a distractor sentence featuring the same word order. Dual-processor architecture hypotheses, however, imply no differentiation in RTs for same and different word-order in target-distractor pairs.

Department of Experimental and Theoretical Psychology, Leiden University, P.O. Box 9555, NL-2300 RB Leiden, The Netherlands

[S-8] SYMPOSIUM EXECUTIVE FUNCTIONS.

Bernhard Hommel

Cognitive psychology has been quite successful in identifying and characterizing a multitude of information-processing stages intervening between stimulus input and overt response. However, surprisingly little is known about how all those stages are tailored to the task at hand and how they are implemented to support and generate voluntary action. Only recently, experimental techniques have been (re-)invented and applied to analyze the responsible "executive functions" and theoretical frameworks pinning down these functions in detail are emerging gradually. The ESCoP symposium brings together leading scientists from that area and, thus, provides a representative overview of the most recent developments in the field of intentional control of behavior.

Cognition & Action, Max Planck Institute for Psychological Research, Leopoldstrasse 24, D-80802 Munich, Germany

[S-9] Task-switching costs without an immediate shift of task: Long-term negative priming (or negative transfer) between competing S-R mappings in Stroop tasks.

Alan Allport
Glenn Wylie

As is well known, the colour-word interference effect (Stroop, 1935) is asymmetrical: incongruent colour-words interfere with colour-naming whereas, in most conditions, an incongruent colour does not interfere with oral word-reading; that is, there is no "reverse Stroop" effect. However, if the word-reading task is preceded by even a few trials of Stroop colour-naming, using the same stimuli, a large "reverse Stroop" effect can be elicited, particularly on the first trial of a run. Moreover, this interference effect is found also on (the first trial of) subsequent blocks of word-reading, without any immediate shift of task from Colour to Word; hence it cannot be the direct result of an executive shift of set. After Stroop colour-naming there is also a more general, inhibitory effect on word-reading that is not item-specific. We report a series of experiments designed to explore these between-task interference effects, in particular the "reverse Stroop" effect. Contrary to the earlier suggestion by Allport et al. (1994), we show that the latter does not depend on the continued activation/inhibition of competing task-sets. It appears to be a relatively long-term retrieval effect, a form of negative transfer, cued by presentation of a stimulus previously associated with a competing S-R mapping.

University of Oxford, St. Anne's College, Oxford OX2 6HS, United Kingdom

[S-10] From task-switching to cognitive control.

Ritske De Jong

An intention-activation model of cognitive control in task-switching will be presented. From this model qualitative predictions can be derived regarding the relation between task-switching efficiency and the quality of performance in a variety of other 'control tasks'. In this talk, I will present the results of a study in which task-switching performance was compared to performance in tasks that emphasized problem solving, inhibition of prepotent actions, interference control, and working memory. Implications of these results for the status of the task-switching paradigm as a tool for investigating cognitive control will be discussed.

Experimental and Occupational Psychology, University of Groningen, Grote Kruisstraat 2/1, NL-9712 TS Groningen, The Netherlands

[S-11] The role of probability cues on task preparation as part of executive control processes.

Gesine Dreisbach
Hilde Haider
Rainer Kluwe

The purpose of our investigations was to identify processes of task preparation in the task-switching paradigm. Paricipants had to answer blocks of 4 different task types which were presented in random order. Each task was preceded by a specific cue, announcing a task repetition or a shift with a probability of 100%, 75%-25%, 50%-50% or 25%-75% respectively. As main dependent variable response latencies for repetitions and shifts were measured. Results show, that response latencies for both, shift items and repetitions, increased as a function of announced probability. However, shift costs between tasks of comparable probability were not affected by this manipulation. According to Rubinstein, Meyer & Evans (in press) these findings support the assumption, that the executive processes involved in switching task-set, consist of two additive components: Goal shifting and rule activation. Dependent on the probability of the informative cue, the process of goal shifting towards the expected upcoming task is more or less complete, but even in the case of reliable advance information (100% probability) reconfiguration can only be accomplished, after the entire task is presented. Further experiments, manipulating CTI, material (stroop vs. non-stroop) and practice, will be reported which support the observed additivity of preparation and execution.

Institute for Cognitive Research, University of The Federal Armed Forces, Holstenhofweg 85, D-22043 Hamburg, Germany

[S-12] Permanent and transient links in the control of stimulus-response translation.

Bernhard Hommel

Beatrix Eglau

Central-bottleneck models of overlapping-task performance claim that stimulus-response translation for secondary tasks is postponed until the primary response is selected. However, Hommel (1998) showed that performance in a primary manual task is affected by compatibility between the verbal response in the secondary task and the primary stimulus (e.g., red color in primary task is responded to faster if secondary response is "red" rather than "green"), suggesting that secondary stimuli are automatically translated into secondary responses before primary response selection is completed. Automatic translation may be mediated by (a) stimulus-response rules temporarily implemented in working memory or (b) acquired associations ("instances") permanently connecting stimuli and responses. We present results from four dual-task experiments favoring the latter, associative view: The effect of compatibility between secondary response and primary stimulus was not even diminished if a working-memory load was introduced or the primary response set was increased; it decreased after a switch of the secondary S-R mapping (suggesting S-R rule "inertia"); and it was still present after subjects had stopped carrying out the secondary task. Our findings are inconsistent with the assumption that stimulus-response translation underlies capacity limitations, and they rule out translation-based bottleneck models of multiple-task performance.

Cognition & Action, Max Planck Institute for Psychological Research, Leopoldstrasse 24, D-80802 Munich, Germany

[S-13] Characteristics of task-set inhibition.

Ulrich Mayr

Coherence of action across time depends on stable internal control settings (i.e., task-sets). However, stability of a control setting may become problematic when circumstances require its fast replacement by a new one. As a solution to this apparent stability-flexibility problem I suggest that changes in task-sets are supported by inhibition targeted at the to-be-abandoned task-set. As a behavioral signature of backward inhibition I report data showing that switching back to a task-set that had to be abandoned recently (i.e., two trials earlier) takes longer than switching back to a task-set that had to be abandoned less recently (i.e., more than two trials earlier). Additional results suggest that backward-inhibition is linked to "executive control" in that it only occurs for top-down controlled set switches. At the same time it seems to be a "dumb" process in that it is not sensitive to valid foreknowledge about the upcoming task-set or even an entire sequence of upcoming task-sets. Finally, I show that backward inhibition can be dissociated from set-specific repetition-priming phenomena.

Institute of Psychology, University of Potsdam, P.O. Box 60 15 53, D-14415 Potsdam, Germany

[S-14] The contribution of negative priming of task-set to the cost of switching tasks.

Switching from task A to task B (where both are afforded by the stimuli) retards performance on the first compared to subsequent task B trials. One hypothesized source of this "switch cost" is the carry-over of an inhibition of task-set B required to accomplish task A on the trial preceding the switch. This has been held to account for the observation (otherwise counterintuitive) of a greater cost of switching from the weaker to the stronger of two tasks afforded—e.g. from colour-naming incongruent Stroop stimuli to naming them aloud (Allport, Styles & Hsieh, 1994, Attention & Performance XV).We will present evidence from three types of manipulation of relative task-strength, for several pairs of tasks: (a) pre-experimental experience, (b) within-experimental recency of practice, and (c) S-R compatibility. We demonstrate that while the counterintuitive asymmetry of switch costs can be observed, it is far from being a universal rule. Moreover, the effect is largely stimulus-specific. We conclude that the inhibitory suppression of a task-set is a control strategy needed only when there is a marked tendency to perform the inappropriate task. Negative priming of task-set is thus only an occasional contributor to the universally-observed cost of switching tasks.

Stephen Monsell
Nick Yeung
Rayna Azuma

Department of Experimental Psychology, University of Cambridge, Downing Street, Cambridge CB2 3EB, United Kingdom

[S-15] SYMPOSIUM NUMERICAL COGNITION.

Wim Fias

Our ability to understand numbers and to perform complex calculations is a fascinating achievement of the human cognitive system. It is therefore not surprising that it has inspired a great deal of research in cognitive psychology. Numerical cognition has been studied at different levels (from understanding and production of numbers to performing complex calculations) and from different theoretical and methodological perspectives (behavioral studies on a normal population, neuropsychological research on brain-damaged patients, brain imaging, developmental studies). At the outset these different perspectives remained rather independent, but nowadays a theoretical integration is steadily growing. It is the aim of this symposium to provide a cross-section of current research in the field and to show how different perspectives converge on a unified research program. Because numerical cognition does not rely solely on specifically numerical mechanisms, but also on general cognitive functions, the symposium will also address broader issues in cognitive psychology, such as language and its role in cognition, memory, the relation between automatic and strategically controlled processing, functional specialisation in the brain and knowledge representation.

Department of Psychology, University of Leuven, Tiensestraat 102, B-3000 Leuven, Belgium

[S-16] From twelve hundred to 1200: A temporal, spatial and kinematic analysis of the handwriting of Arabic numerals as a function of the lexical and syntactic structure of the verbal input form.

This study focuses on the handwriting production of Arabic numerals through a series of three experiments. The technique used, the digitizing tablet, allows one to analyze the temporal, spatial, and kinematics characteristics of handwriting production. To our knowledge, it has never been used to study specifically Arabic number writing, and thus, the first experiment was an exploratory one which purpose was to examine the graphic complexity of the digits in different positions. The second and third experiments address a specific issue of the numerical domain: does the lexical and syntactic structure of verbal numerals influence the production of Arabic numerals? Subjects had to write down Arabic numerals between 1100 and 1999, that were presented in two different written verbal forms: a teen-hundred structure (twelve hundred) or a thousand-unit-hundred structure (one thousand two hundred). Results show differences in the pauses between digits that reflect additive relations of the verbal numerals. This finding is discussed in regards to different models of numeral transcoding (McCloskey, Caramazza & Basili, 1985; Power & DalMartello, 1990; 1997).

Aliette Lochy

Unité de neuropsychologie cognitive, Université Catholique de Louvain, 10 place du Cardinal Mercier, B-1348 Louvain-La-Neuve, Belgium

[S-17] The functional locus of magnitude information and some properties of the processes giving access to it.

Wim Fias
Marc Brysbaert
Johan Lauwereyns
Géry d'Ydewalle

The meaning of a number, with numerical magnitude as the most important aspect, is not explicitly specified in the way a number is symbolically represented. Thus, number meaning has to be stored somehow in memory to be accessible from symbolic representations. A lot of research efforts have been devoted to determine the functional locus of the internal magnitude system with respect to the surface codes (of which Arabic and verbal codes are the most important ones). Several views have been put forward. According to one view, magnitude information is central to all types of number processing. Other models reject such a central magnitude system and incorporate asemantic processing mechanisms. We will report evidence in favor of an architecture which combines the two positions: a single semantic route for the processing of digits and a double route (one semantic, the other asemantic) for the processing of number words. But, modelling cognitive behavior and in this particular case numerical cognitive behavior requires not only an architecture that describes the different types of information and how they are interconnected, but also a specification of the nature of the transmission of information from one code to the other. Without explicit hypotheses on processing properties, models are not sufficiently constrained in order to become fully testable. Therefore, we explicitly tested the autonomous nature and the temporal dynamics of semantic access.

Department of Psychology, University of Leuven, Tiensestraat 102, B-3000 Leuven, Belgium

[S-18] Number parity and the mental number line—an fMRI study.

Klaus Willmes
S. Kemeny
Suzanne Weis
S. Pollrich

In the anatomo-functional model of Dehaene and Cohen a bilateral analogue magnitude representation of numbers is assumed in addition to a visual number form and a verbal word form. The SNARC-effect in number parity decisions for Arabic digits points at involvement of a quantitative internal number representation although access to number magnitude is not required for parity decisions. Fias and colleagues have presented a hybrid model that postulates a single semantic route for the processing of Arabic digits resulting in a SNARC-effect even for non-semantic properties and a double, semantic and asemantic route for the processing of verbal numerals. Silent mental parity decisions for Arabic digits and number words have been studied in an fMRI experiment (1.5T Philips Gyroscan) in 20 healthy right-handed male subjects as well as decisions on a surface property (digit symmetry resp. letter monitoring) and passive viewing of Arabic digits and number words. Activation of right (and left) inferior parietal cortex (BA 40) is present for all simple contrasts vs control of tasks comprising arabic digits as well as number words except for passive viewing. Access to semantic properties of numbers seems to be mediated by the right middle temporal gyrus (BA 21). In all tasks, widespread networks get activated also including (pre-)frontal, pre-SMA and (lateral) occipital structures.

Interdisciplinary Center for Clinical Research, Neuropsychology, Lehr- und Forschungsgebiet Neuropsychologie an der Neurologischen Klinik der RWTH Aachen, Pauwelsstrasse 30, D-52057 Aachen, Germany

[S-19] The supervisory attentional system, contention scheduling and the transcoding of numerals in Alzheimer's disease.

Marc Thioux

When they are writing down numerals in the arabic or in the verbal code, patients with Alzheimer's disease (AD) make frequent intrusions of the unintended code. For example, two thousand is transcoded 2 thousand (instead of 2000) and 43 is transcoded forty 3 (instead of forty-three). Two interpretations have been advanced to explain these errors: they could occur because the production of arabic numerals is more frequent and automatic than the production of verbal numerals or because of a deficit of attention. However, none of these interpretations prove satisfactory to explain the available set of data. A detailed analysis of the performance of a patient with AD who made a lot of verbal code intrusions during the production of arabic numerals led to conclude that the presence of intrusion errors could be better accounted for by the co-occurrence of two distinct deficits: an impairment of inhibitory processes on one hand and an impairment of the transcoding mechanism per se on the other.

Unité de Neuropsychologie, Université Catholique de Louvain, 10, Place du cardinal Mercier, B-1348 Louvain-la-Neuve, Belgium

[S-20] Arithmetic by eye an by ear.

Researchers have explored the effects of format on processing of single-digit arithmetic problems, contrasting Arabic digits (e.g., 3 + 4), number words (e.g., three + four), and patterns of dots (e.g., :. + ::). Researchers have not compared processing in auditory and visual formats, however. In two experiments, participants solved single-digit arithmetic problems in two formats; Arabic digits presented visually and number words presented aurally. In Experiment 1, English-speaking participants solved visual problems more quickly than auditory problems, whereas Chinese-speaking individuals did not respond differentially by format. Detailed analyses of errors indicated that more phonological errors (i.e., intrusions of operands into answers as in 8 x 4 = 24) occurred in the auditory than in the visual format. However, although Chinese-speaking individuals made more phonological errors than English-speaking individuals, the increase in phonological errors in the auditory condition was equivalent for the two language groups. In Experiment 2, English-speaking undergraduates solved multiplication and addition problems. As in Experiment 1, visual problems were solved more quickly than auditory problems. Furthermore, the processing cost of auditory presentation was largest on the most difficult addition problems. These findings will be examined in light of several competing models of numerical cognition.

Jo-Anne LeFevre
Qingwen Lei
Dawn B. Mullins

Centre for Applied Cognitive Research, Department of Psychology, Carleton University, Ottawa, ON, K1S 5B6, Canada

[S-21] A life-span study of strategy choices in computational estimation.

Patrick Lemaire
Mireille Lecacheur
Fernand Farioli
Sandrine Duverne

The goal of the present work was to assess strategic aspects of cognitive aging. We used the theoretical framework originally proposed by Lemaire and Siegler (1995) to analyze several aspects of strategy use, namely (a) which strategies people use; (b) when each strategy is used (i.e., on what type of problems), (c) how each strategy is executed (i.e., speed, accuracy), and (d) how are strategies chosen among. The present empirical work was pursued in the context of computational estimation. Children, adolescents, and adults of varying age had to estimate as quickly as possible (and in less than 5 seconds) the result of problems like 367+789. Two methods were used: the choice method (people could use whatever strategy they wanted) and the choice/no-choice method (enabling to control potential selection artifacts). The data illuminate which aspects of strategy use change with age and which aspects remain constant. We shall discuss the implications of these results at the general level of human cognition and the role of cognitive strategies, the role of strategic aspects in life-span cognitive.

CREPCO-CNRS, UFR de Psychologie, University of Provence, 29 Av. Robert Schumann, F-13621 Aix-en-Provence, France

[S-22] SYMPOSIUM
ESTIMATING DURATION: DIRECTIONS FOR FUTURE RESEARCH.

Gino De Vooght

Vicky Franssen

Since the nineties, the study of subjective duration has been directed towards an integration of a vast amount of seemingly contradictory findings. It has been acknowledged that prospective and retrospective duration estimation are based on the processing of different kinds of information. It has also been shown that the former is subject to a trade-off between the processing of temporal and non-temporal information. Explanatory models have been formulated which combine attention allocation processes with internal timer models of duration estimation. While attention allocation is supposed to regulate the amount of attentional resources spent on the processing of temporal and non-temporal information, internal clock models such as scalar timing provide an account of how temporal information can be generated and processed. Another line of research revealed that duration estimation of meaningful events involves top-down, knowledge-based expectancy processes. According to such explanations, temporal structure is part of event representations. When an event is encountered, a matching representation is activated and triggers expectancies about the event's temporal course. Discrepancies between the actual and the expected event-course have been shown to influence duration estimation. It is the aim of this symposium to explore the ways in which integration is possible. Is knowledge-based attending a matter of attentional shift, or can we do away with the attention and timer concept in favour of reconstructing and imagining events experienced during stimulus presentation. Whilst the first alternative focuses on the encoding of duration, the second one focuses more on estimation and reproduction processes, i.e., on how an estimate is inferred from memory.

Department of Experimental Psychology, University of Gent, Henri Dunantlaan 2, B-9000 Gent, Belgium

[S-23] Some new directions in scalar timing research with humans.

John H. Wearden

The last 10 years have seen a considerable growth of interest in the application of scalar timing theory, initially developed by Gibbon and associates as an account of animal timing, to timing in humans. Early work was concerned with showing conformity of human timing behaviour with scalar timing predictions, particularly behaviour on tasks analogous to animal timing tasks. Since then, scalar timing has been applied to timing in old people and children, and has also been used to address some classic problems in time psychology, such as why "tones last longer than lights". The paper discusses some new directions in scalar timing research with humans. One is to use data from humans to attack a difficult problem in time psychology, that of where the variability in timing behaviour actually comes from. A second line of research is temporal decision making, the study of the way that decisions about, for example, whether two presented durations are actually the same, are actually performed. Finally, some new work examines the concept of the "internal clock" more precisely than before, in particular exploring the idea that "clock speed" is affected by arousal. Data from timing tasks conducted concurrently with psychophysiological manipulations or rating scale measurement of arousal will be presented.

Department of Psychology, University of Manchester, Manchester M13 9PL, United Kingdom

[S-24] Activation and attention in time estimation: Electroencephalographic and behavioral studies.

Borís Burle
Laurence Casini
Françoise Macar
Franck Vidal

The duration of external signals is judged increasingly longer the more as the level of activation or of attention increases. According to the attentional model of time perception, this can be due to several factors. Increasing the general arousal level may speed up an internal pacemaker; increasing the attention devoted to time may optimize the accumulation of internal pulses during the target period. We will first describe an electroencephalographic study showing a clear relationship between the level of cortical activation in frontal areas and the timing performance. However, it is hard to know whether this cortical activation reflects an increase in the attention devoted to time processing or in the arousal level. Furthermore, attention is sometimes conceptualized as an activation of specific processes. To address the question of whether attention and activation involve common mechanisms, we investigated each process independently. We acted on attention by introducing a concurrent Reaction Time task, and on activation by delivering auditory clicks of two different intensities.The two factors proved to be independent. This is in agreement with the idea that activation affects the pacemaker's rate, whereas attention affects the number of pulses accumulated. Attention seems to have an all or none effect, which suggests that it may switch on and off the temporal accumulator.

Equipe "régulations temporelles de l'activité", Centre de Recherche en Neurosciences Cognitives, CNRS, 31 Chemin Joseph Aiguier, F-13402 Marseille cedex 20, France

[S-25] The role of timing mechanisms, attention and memory processes in the evolution of time estimation with age.

Viviane Pouthas

Unité de Neurosciences Cognitives et Imagerie Cérébrale, LENA-CNRS, UPR640 UPMC, Hôpital de la Salpetrière, 47 bld de l'Hôpital, F-75651 Paris Cedex 13, France

Internal timer models of duration estimation provide a relevant framework to question whether age effects in duration judgment depend on potential changes in the rate and variability of the pacemaker component of an internal clock or whether they are the result of changes in general cognitive factors such as increase or reduction of memory ability and attentional capacity. This issue will be considered in the light of studies, concerning particularly young adults' and elderly people's timing performances. Internal tempo has been shown to slow down with increasing age, but a slower pacemaker rate cannot account for all age-related differences in duration estimation. In fact, elderly peole's timing performances are particularly impaired (less accurate and more variable) when temporal task demands are important. Such impairments are mainly discussed in terms of age-related reduction of attentional resources and working memory deficits. This raises the question whether or not some characteristics of processing task difficulty are specific to duration estimation. Further experiments contrasting temporal and nontemporal tasks should clarify this issue. First results of an experiment conducted on this line that compares the topography of brain potentials in young and old adults will be discussed.

[S-26] Automaticity and interference in concurrent temporal and nontemporal processing.

Two experiments examined the interference effect in timing, in which a concurrent nontemporal task disrupts timing by making time judgments more variable and/or inaccurate. This effect can be explained by attentional allocation, such that the more resources devoted to nontemporal demands, the fewer resources available for timekeeping. In previous research, Brown (1998) found that practice on a nontemporal task attenuated the interference effect in timing. Practice leads to automaticity, a reduction in the amount of processing resources needed to perform a task. The present research was designed to replicate and extend the previous results. Subjects generated a series of 5-s temporal productions under control (timing only) and experimental (timing plus a nontemporal task) conditions. The nontemporal tasks were pursuit rotor tracking (Experiment 1), and mirror-reversed reading (Experiment 2). We employed a pretest-practice-posttest paradigm, with the practice sessions devoted to performance of the nontemporal task. Pretest-posttest comparisons showed that practice reduced interference in timing in both experiments. Dual-task probe trials were given during the practice sessions to trace the time course of the improvement in timing. The results showed that interference in timing was reduced with even small amounts of practice. The findings demonstrate that timing is a cognitive process that is very sensitive to changes in the allocation of attentional resources.

Scott W. Brown

Elizabeth D. Bennett

Department of Psychology, University of Southern Maine, Portland, ME 04104-9300, USA

[S-27] Remembered duration: Coordinative demands on working memory and the reproduction of intervals.

Stephan Dutke

A theoretical framework will be presented that explains how the duration of an event is reproduced. Based on the assumption that the duration of a stimulus interval (SI) is implicitly represented in the episodic memory about the interval's contents, two hypotheses are posed: The duration of an SI can be reproduced by simulating it in a temporal mental model (reconstruction hypothesis). Encoding episodic information about the event can be obstructed by coordinative demands on working memory during the SI. As a consequence, the reproduced duration should be shorter the higher the coordinative demands were during the SI (working memory hypothesis). Five experiments with adult participants will be presented, demonstrating that (a) prospective and retrospective time reproductions were impaired by coordinative demands on working memory during the SI, but (b) sequential demands on working memory or demands on visual attention did not affect prospective time reproductions, and (c) presenting supportive temporal cues during the reproduction phase improved prospective and retrospective time reproductions independent of previous encoding activities. The results cannot easily be reconciled with attentional models of time estimation, but they support the reconstruction hypothesis as well as the working memory hypothesis.

Freie Universität Berlin, FB 12, WE08, Habelschwerdter Allee 45, D-14195 Berlin, Germany

[S-28] Mental models of time.

The relational approach to time is based on local times that are constrained by inherent properties of events. Local times provide cognitive anchors for the ways we perceive and represent certain aspects of reality. That is, for most mental representations a local time-encoding is derived that will minimize the complexity of the dynamics involved. Our ability to cope with change relies on both evolved and learned mechanisms that can detect such "minimal" representations. Examples from several domains will be presented, demonstrating that underlying the relativistic local representations of time that serve us in many different contexts—including, among others, history, economics, psychology and art—is a limited number of universal cognitive mechanisms that may have their basis in the evolution of the human mind.

John A. Michon

Leiden University, Brigantijnwal 7, NL-2317 GL Leiden, The Netherlands

[S-29] SYMPOSIUM
BILINGUAL LEXICAL PROCESSING.

Jonathan Grainger

This symposium brings together leading researchers in the currently highly active field of bilingual lexical processing. Although bilingualism has always had its place in psycholinguistic research, there is a growing awareness of the significance of research in this area, as attested by the appearance of specialized journals. The present symposium provides a cross-section of current psycholinguistic research on bilingualism, limited specifically to word perception and production. The areas covered by the presentations include speech perception and production, and orthographic, phonological, morphological, and semantic processes in printed word recognition and reading aloud. The key issues to be examined in the different presentations include an analysis of cross-language competition in comprehension and production, and a study of the similarities and differences in processing of the mother tongue as opposed to a second language. The reported data are brought to bear on the issue of how the different types of representation that code information about words in the bilingual's two languages are structured in memory. One general conclusion is that any plausible architecture must reflect the fact that, although the bilingual has considerable control over use of one language or the other, cross-language interference is systematically observable.

CNRS & University of Provence, Av. R. Schumann 29, F-13621 Aix-en-Provence, France

[S-30] BIMOLA: A connectionist model of bilingual spoken word recognition.

Over the last few years, various psycholinguistic studies have been concerned with the processes which underlie bilingual language perception. Written language has been explored more than speech, however, despite the fact that bilinguals spend more time speaking than they do writing and that, when speaking, they have to process both monolingual utterances in their two (or more) languages and mixed utterances that contain code-switches and borrowings. Based on experimental research investigating how bilinguals recognize guest words, we have developed BIMOLA (Bilingual Model of Lexical Access), a localist connectionist model of bilingual spoken word recognition. Our talk will present this model and include a computer demonstration. Like TRACE, which focuses on monolingual spoken word recognition, BIMOLA consists of three levels of nodes (features, phonemes and words), and it is characterized by various excitatory and inhibitory links within and between levels. Among its particularities, we find shared phonetic features for the two languages (in this case, English and French), parallel and independent language processing at the higher levels, and the absence of cross-language inhibition. The architecture we propose can account for a number of well established monolingual effects as well as specific bilingual findings.

Nicolas Lévy

François Grosjean

Laboratoire de traitement du langage et de la parole, Université de Neuchâtel, Avenue du 1er-Mars 26, CH-2000 Neuchâtel, Switzerland

[S-31] Recognition of cognates and interlingual homographs: The neglected role of phonology.

Ton Dijkstra
Walter J. B. van Heuven

Dutch-English bilinguals were tested with English words varying in their degree of orthographic, phonological, and semantic overlap with Dutch words. Thus, an English word target could be spelled the same as a Dutch word, and/or could be a near-homophone of a Dutch word. Whether or not such form similarity was accompanied with semantic identity (translation equivalence) was also varied. In a progressive demasking task and a visual lexical decision task very similar results were obtained. Both tasks showed facilitatory effects of cross-linguistic orthographic and semantic similarity on response latencies to target words, but inhibitory effects of phonological overlap. A control experiment involving English lexical decision with monolinguals indicated that these results were not due to specific characteristics of the stimulus material. The results are interpreted within an interactive activation model for monolingual and bilingual word recognition (the BIA-model) expanded with a phonological and a semantic component.

Nijmegen Institute of Cognition and Information (NICI), University of Nijmegen, P.O. Box 9104, NL-6500 HE Nijmegen, The Netherlands

[S-32] Rapid semantic activation of the lexicon in bilinguals.

Chéryl Frenck-Mestre
Jonathan Grainger
Steve Bueno
Morgan Schuller-Guillo

Recently, Grainger and Frenck-Mestre (1998) showed robust, cross-language semantic priming at extremely brief prime exposures (29 and 43 ms) for non-cognate translation pairs (e.g., "baleine-whale"). These results, obtained for highly skilled bilinguals and via the use of a semantic categorization task, underline the importance of both L2 proficiency and task demands when investigating semantic processing in bilinguals. The current series of experiments aimed to extend the results of Grainger and Frenck-Mestre. On the one hand, the involvement of phonological codes in semantic processing was examined. More specifically, the hypothesis that access to meaning from a printed word occurs predominantly via phonological codes was tested by means of homophone translation priming. Under the phonological hypothesis, masked translation priming should occur in like manner for true translations (e.g., "soie-silk") and homophone translations (e.g., "soi-silk"). The latter pairs should not produce priming if meaning is accessed directly via orthographic representations. On the other hand, a wider range of relationships than translation equivalents was examined. Notably, the finding (Frenck-Mestre & Bueno, in press) that masked semantic priming (29 and 43 ms of prime exposure) is obtained in monolinguals for prime-target pairs which have high featural overlap (e.g., "whale-dolphin") was tested for cross-language pairs (e.g., "baleine-dolphin").

University of Provence, Av. R. Schumann 29, F-13621 Aix-en-Provence, France

[S-33] Cross-language morphological effects: Some evidence from Catalan-Spanish bilinguals.

Rosa M. Sanchez-Casas

José E. Garcia-Albea

The present study examines the possibility that cognate translations could be assimilated to a morphological relation across languages. Prior work (Garcia-Albea, Sanchez-Casas, & Igoa, 1998) with Catalan-Spanish bilinguals compared within- and between-language morphological masked priming effects in cognate and noncognate words pairs, using gender and number inflections. The results of this experiment revealed the existence of a cross-language morphological effect only for cognate words, which was comparable in size to the cognate-translation effect and the within-language morphological effect. On the basis of this evidence, the aim of the experiment we report in this paper is to examine whether cross-language morphological effects are also obtained with cognate words, when verbal inflections are used. We test Catalan-Spanish bilinguals in a Spanish lexical decision task, using the masked priming technique. Both cognate and noncognate verbs are presented as targets in the infinitive form, preceded by four different types of primes: a) a cross-language morphologically related conjugated form (e.g., aprenc-APRENDER; ploro-LLORAR); b) a within-language morphologically related conjugated form (e.g., aprendo-APRENDER; lloro-LLORAR); c) a translation (e.g., aprendre-APRENDER; plorar-LLORAR); and d) an unrelated control (condenar-APRENDER; comer-LLORAR). The results obtained are discussed in relation to the role that morphology could play as a general principle of lexical organization in bilinguals.

Departamento de Psicología, Universidad Rovira I Virgili, Carretera de Valls, s/n, E-43007 Tarragona, Spain

[S-34] Lexical decision, word naming, and perceptual identification in the native and a foreign language.

The goal of the work presented here was to reveal determinants of word recognition in both the native language (Dutch) and in a strong foreign language (English), and to reveal commonalities and differences of word recognition in these two languages. To this end both lexical-decision and word-naming responses were collected to a set of 440 Dutch words and their English translations. For all of these 880 words, scores on a large set of word characteristics had been collected previously. In all, these word characteristics covered the words' meaning, their familiarity, their relationship with other words in the lexicon, and their length. In the present study these word characteristics served as predictor variables, whereas the response times in the lexical-decision and word-naming tasks served as criterion variables. In addition to lexical decision and word naming, perceptual identification has been used as a task that is thought to tap into the process of word recognition. We have started to collect perceptual-identification responses to the 880 stimulus words as well. These will serve as a third criterion variable. The focus of the discussion will be on the commonalities and differences of the patterns of correlations that occur for the two languages and for the three word-recognition tasks.

Annette M. B. De Groot

Department of Psychology, University of Amsterdam, Roetersstraat 15, NL-1018 WB Amsterdam, The Netherlands

[S-35] Cross-language lexical activity during production: Evidence from cued picture naming.

Judith F. Kroll
Ton Dijkstra
Niels Janssen
Herbert Schriefers

Recent evidence on bilingual word recognition suggests that words in both of the bilingual's languages are active even when the task requires recognition of words in one language alone. In the present study we considered the implications of parallel lexical activity across the bilingual's two languages for language production. When a bilingual intends to name a picture in only one language, are lexical candidates in the other language also available? A series of experiments is reported in which a cued picture naming paradigm was used to manipulate the required activity of words in a bilingual's two languages during production. In mixed language conditions, participants did not know the language of naming until an auditory cue was presented. In blocked language conditions, the language of naming was known in advance. By varying the timing of the presentation of the cue and the type of translation equivalent (e.g., whether the pictures' names were cognates in the two languages) we aimed to identify the locus of cross-language lexical activity. Picture naming performance by Dutch-English and English-French bilinguals provides evidence to support the claim that translation equivalents function as close competitors during production. We consider the implications of our findings for models of language production and bilingual representation.

Department of Psychology, Pennsylvania State University, 641 Moore building, University Park, PA 16802, USA

[S-36] SYMPOSIUM
DEDUCTIVE REASONING, STRATEGIES AND INDIVIDUAL DIFFERENCES.

Walter Schaeken

The last thirty years, the study of deductive reasoning has become very important. Three schools of study emerged. First, there are researchers, who follow closely the work of Wason and who can be called bias psychologists. Second, there are researchers who follow the footsteps of Piaget and claim that people are equipped with an internal logic. Third, there are researchers, who claim that reasoning is based, not on syntactic derivations as the previous school proposes, but on manipulations of mental models, which represent situations. Between proponents of the latter two schools, there is considerable rivalry about the nature of the basic deductive machinery. Surprisingly, current theories of deductive reasoning have largely neglected the topic of strategies and of individual differences, unlike theories concerning other domains of reasoning. It is the goal of this symposium to gather researchers, who consider carefully the role of strategies and of individual differences for deductive reasoning. It is only when one has a clear idea of their role that one can effectively further develop the different general theories. In the symposium, the possible role of strategies and individual differences for different domains of deductive reasoning (propositional, probabilistic, syllogistic, spatial and relational reasoning) will be discussed in five lectures.

Department of Psychology, University of Leuven, Tiensestraat 102, B-3000 Leuven, Belgium

[S-37] Working memory and individual differences in syllogistic and spatial reasoning.

Alison Capon
Simon Handley
Ian Dennis

Working memory capacity is implicated as a limiter on reasoning performance by a range of theorists attempting to account for the processes underlying deductive competence. For example, it has been argued that the difficulty of reasoning problems is a function of the number of models that must be simultaneously held in working memory or alternatively the number of rules that must co-ordinated in working memory in deriving a proof of the conclusion from the premises. Individual variation in reasoning performance is explained as a function of variations in working memory capacity. In this paper we present the results of three experiments that examined the relationship between working memory capacity and performance on syllogistic and five term spatial reasoning problems. Experiment 1 explored the relationships between complex and simpleworking memory measures and verbally presented reasoning tasks. The results showed that syllogistic reasoning and spatial reasoning performance correlated with both verbal and spatial working memory capacity. Experiment 2 varied the modality of presentation of the spatial reasoning task and showed that visually presented spatial tasks correlated most highly with complex spatial working memory measures. In Experiment 3 the modality of presentation of the syllogistic task was varied. Syllogistic performance correlated with both spatial and verbal working memory measures, independent of modality of presentation. A multi group confirmatory factor analysis of all three experiments supported a three factor model, incorporating a general factor which included all of the reasoning tasks and the complex spatial and verbal span measures, a verbal factor which included the simple verbal span, and a spatial factor which included the simple spatial span. These findings are discussed both in the context of current theories of human reasoning and in terms of their implications for arguments concerning the structure of working memory.

Department of Psychology, University of Plymouth, Drake Circus, Plymouth, Devon PL4 7JS, United Kingdom

[S-38] When the number of cases counts—A study on probabilistic factors in picture-sentence verification task.

The paper explores an experimental procedure invented by Evans Ellis and Newstead (1996). In the first experiment reasoners answered questions whether a conditional sentence was true or false with respect to a set of 20 geometrical figures presented on a computer screen. Those figures either agreed with the conditional or not and they represented different cases for the conditional (TT, FF, FT and TF when the conditional was false with respect to all figures). The numbers of different figures presented on the screen were systematically varied. The second experiment used exactly the same material. This time the participants assessed subjective probability that a figure taken at random will be, e.g., blue, given that it is a square. The results of both experiments support the thesis that naive reasoners usually know when a conditional is true and they do not know when it is false. Even if counterexamples are directly represented it is safer to say that nothing follows than to treat the conditional as falsified. It is possible that most reasoners evolved good strategies of asserting when an implication is valid while only some of them have the ability to see when it is false. The number of "cases" for a conditional is important only when the conditional is presented in positive and not in negative form. The analysis of reaction times showed also that dealing with negation requires more time than dealing with positive conditionals in both versions of the task.

Robert Mackiewicz

Department of Experimental Psychology, Catholic University of Lublin, Al. Raclawickie 14, PL-20-950 Lublin, Poland

[S-39] Learning style and constraining the language: individual differences in solving syllogisms.

Padraic Monaghan

The serialist-holist learning style has been found to describe and predict behaviour in a number of complex reasoning domains. This learning style relates to the metalogical properties of the syllogistic reasoning task, where students have to learn to constrain their reasoning to a limited fragment of language. Students' learning of syllogisms is fundamentally tied up with their preference for either exploring the constraints of the whole syllogistic system first, or for accepting the constraints and building up the larger picture by working within the system. The area of study is a teaching syllogism task, which compared two computationally similar methods of solving syllogisms. It was found that: 1) Holistic students are more likely to make or attempt to derive conclusions that lie out with the language of the syllogistic system; 2) Holistic students prefer a representational system for solving syllogisms that better observes the constraints of the syllogistic system. The theory driven by these observations is supported by a pilot study that presented syllogistic fragments that either increased or decreased in size, and examined the changing responses of students to these problems. Conceiving of serialism and holism in this way enables a more computational description of the learning style to be established. In addition, individual differences in reasoning can be seen to be, at least partially, determined by the relationship between the student and the system within which the problems are presented: changing the system means a change in the reasoning process.

School of Cognitive Science, University of Edinburgh, 2 Buccleuch Place, Edinburgh EH8 9LW, United Kingdom

[S-40] Strategies in relational inference.

Three experiments are reported in which the relationships between task format, item type and strategy usage were investigated for a relational inference task. Contrary to past findings with linear syllogisms, it was found that parallel presentation (presenting problem statements simultaneously) did not result in any increased use of deduction rule processes compared with serial presentation (presenting problem statements singly). Instead, it was found that mental models were used by the majority of subjects, and that multiple models were more likely to be used with parallel presentation. Contrary to suggestions by Polk and Newell (1995), reasoning with multiple models, where supported by task format, was found to be prevalent and highly robust, even where this was disadvantageous. It is suggested that, in general, their use will be more likely for deduction tasks where the cognitive load is relatively low.

Maxwell Roberts

Department of Psychology, University of Essex, Wivenhoe Park, Colchester, Essex CO4 3SQ, United Kingdom

[S-41] How does the content affect conditional reasoning with different formulations? The case of warning and threats.

Nuria Carriedo
Juan A. Garcia-Madruga
Sergio Moreno
Francisco Gutiérrez

We will present two experiments whose main objective is to test how warnings and threats affect conditional reasoning with different formulations. For that purpose, four conditional formulations were selected: 'if then', 'if not then', 'only if' and 'unless' which are crossed with four different types of contents: arbitrary, neutral, warnings and threats. Participants were randomly assigned to a different experimental condition (conditional formulation). Each participant had to work out 16 deduction problems, four of each one of the basic inferences: MP, DA, AC, and MT, and four of each type of content. Results showed different response patterns for warnings and threats, and indicate that content affects conditional reasoning acting upon the number of models reasoners build and use throughout the deduction process. However, this effect is not independent from the conditional formulation from which reasoners have to make inferences. Shortly, conditional threats tend to be interpreted as biconditional for all types of conditional formulations, whereas the interpretation of conditional warnings is more dependent on the formulation. To confirm these results, we carried out a second experiment in which we asked participants to generate possible alternatives to the antecedent or the consequent. We expected that when reasoners interpret conditionals as biconditionals, the number of possibilities generated will significantly decrease. Results are discussed in terms of the Mental Model Theory.

Department of Psychology, UNED, E-28040 Madrid, Spain

[S-42] Spatial reasoning, strategies and individual differences.

This talk reports some experiments of the mental model theory of spatial reasoning. A problem of the following sort, where the letters denote common objects: "a before b; c before b; d in front of b; e in front of c; What is the relation between d and e?" calls for at least two alternative models to be constructed in order to give the right answer for the right reason (d after e). However, if reasoners build only one of the possible models, they would still produce the right answer. We report some experiments in which the problems were presented simultaneously or sequentially. Furthermore, we report some experiments in which participants could use external aids to help their reasoning. The data show that some people indeed build multiple models, but that others build only one model.

Walter Schaeken

Department of Psychology, University of Leuven, Tiensestraat 102, B-3000 Leuven, Belgium

[S-43] SYMPOSIUM
FUNCTIONAL ASPECTS OF VISUAL ATTENTION.

Wilfried Kunde
Joachim Hoffmann

Research on visual attention has a tradition in European Psychology at least since the classical work of Donald Broadbent. The growing interest of European researchers in visual attention is reflected in the expansion of thematic sessions concerning this topic on recent conferences of the society. Since special emphasis will be given to the topic of attention on the 11th conference of $\mathcal{ESC}_o\mathcal{P}$ in Gent, it seems quite natural to us that the ongoing research on visual attention should be represented in an own thematic symposium. As in other areas the research on visual attention has split into a number of specific and detailed debates during the last two decades. This "microanalysis" of visual attention provided us with a number of important insights e.g., into the temporal and spatial aspects of orienting attention, the type of stimuli that capture attention, and spatial frames of reference attention operates on. However, it seems surprising that there are even more basic questions on visual attention that still remain unresolved. The most fundamental of them concerns its functional role: What precisely is visual attention good for? A variety of answers to this question have been given so far, among them are: Visual attention facilitates signal detection, it is the gate to short-term memory and consciousness, it is the "mental glue" for binding features, and it provides the motor system with the spatial parameters that it needs to perform coordinated behavior. We feel that a complete picture of visual attention can only be achieved when the "microanalysis" of visual attention remains closely linked to ideas about its functional aspects. The symposium intends to provide a forum in which researchers from both kinds of research strategies can enter a dialogue that will hopefully inspire their research in new ways.

Psychologisches Institut III, Universität Würzburg, Röntgenring 11, D-97070 Würzburg, Germany

[S-44] Selective visual attention: Three basic control processes.

Werner X. Schneider

Based on a combination of recent attentional theories, namely, TVA (Bundesen, 1990), CTVA (Logan, 1996), the integrated competition hypothesis (Duncan, 1996) and VAM (Schneider, 1995), three basic control processes of selective visual attention will be described. For this purpose, the following main assumptions about visual processing are made. Visual processing consists of two main stages (Neisser). Within the first stage of processing, perceptual (visual) units are formed. These visual units and their categorizations (e.g., according to color, shape, etc.) compete for action control within the second stage. Three basic attentional processes exert control in both processing stages, that is, they determine the unit formation process and influence the competition for action control. The first control process determines which pieces of visual information are grouped (segmented) into units. The second control process ("filtering", Bundesen) determines the relative strength at which each unit competes for action control. Units that fit the internal target object category (e.g., select the red objects) are given high priority in competition. The third process ("pigeonholing", Bundesen) determines the relative strength at which each categorization of a unit competes for action control. Categorizations along the response category (e.g. reporting letters) are given high priority.

Institut für Psychologie, Ludwig-Maximilians-Universität, Leopoldstrasse 13, D-80802 München, Germany

[S-45] Spatial attention in early vision.

Jan Theeuwes
Arthur F. Kramer
Paul Atchley

The present study addressed whether the allocation of attention to a particular region in space can prevent processing of distractor information from non-attended regions. A cue indicated the area in visual space where the target singleton would be presented. Observers were required to detect this target singleton and ignore a distractor singleton presented within a non-attended region. The results indicate that the allocation of attention to a region in space cannot prevent the processing of unwanted information from elsewhere in the visual field. It is concluded that the function of the allocation of attention is not to enhance the processing capacity within the attended region but rather to attenuate interference from distractors in unattended regions.

Cognitive Psychology, Free University Amsterdam, De Boelelaan 1111, NL-1081 HV Amsterdam, The Netherlands

[S-46] Automatic orienting of spatial attention and mental set.

We present a number of experiments in which we explore the effect of endogenous factors on the exogenous attentional effects—costs and benefits (Posner, 1980)—obtained with peripheral cues uninformative about target location in an easy discrimination task (X v O). We find significant interactions between exogenous orienting and several variables related to endogenous processing, including: central precuing effects, instructions manipulation, shift of task-set, personality traits, compatibility of the nature of the peripheral cue with the task at hand, etc. Taken together, our results show that there is not a "pure" attentional capture independent of mental set. Instead, spatial orienting seems to be influenced by non-spatial factors related to subject intentions.

Emilio Gomez Milan
Francisco Tornay

Departamento de Psicología Experimental, Universidad de Granada, E-18071 Granada, Spain

[S-47] Space perception and attentional shifts.

Jochen Müsseler

Attentional shifts within the visual field are often seen to operate on a given spatial map, that is, attention can be assigned to certain areas of the perceived space to pick up information and to accentuate processing (space-based selection). As a consequence, there is a line of research trying to determine the spatiotemporal course of focussing. However, findings are not very clear and often rather arbitrary with regard to their assumed attentional courses. Additionally, several phenomena indicate that selection mechanisms cannot only be space-based, but they can also establish a spatial representation that is used for perceptual judgements. In other words, selection mechanisms can be space establishing as well. Findings supporting this view are discussed. They further correspond with the view that attentional shift and intended eye movement are strongly coupled, and therefore, actual and intended eye position contribute to the metric of perceived space.

Max Planck Institute for Psychological Research, Leopoldstrasse 24, D-80802 München, Germany

[S-48] The adaptation of visual attention to covariations of objects and locations.

Visual attention selects not only locations and not only objects but it is also selective with regard to joint combinations of locations and objects: If in a visual search task different targets are presented with different frequencies at certain locations, detection time depends on the frequency with which the current target was formerly experienced at the current location (Hoffmann & Kunde, in press). The present experiments ask for the concrete nature of these "location-specific target expectancies". It is examined i) whether the effect is based on a facilitation of target recognition or on a response bias, ii) which spatial reference frame is used in order to specify the locations to which target expectancies refer to, and iii) whether focussing of target location is required to let the effect take place. The results are discussed in a general frame in which attention is regarded as supporting the egocentric localization of objects by using redundancies in their spatial distribution.

Joachim Hoffmann

Wilfried Kunde

Lehrstuhl Psychologie III, University of Würzburg, Röntgenring 11, D-97070 Würzburg, Germany

[S-50] SYMPOSIUM
VISUO-SPATIAL WORKING MEMORY.

Hubert D. Zimmer
Gilbert Mohr

The concept of visuo-spatial working memory (VSWM) is still remarkably underdeveloped. Although there is evidence suggesting specific components for spatial and visual information, there is a considerable lack of evidence regarding the storage and refresh mechanisms of these components as well as regarding the functions of VSWM. Is VSWM playing a significant role in perceptual analysis, in motor planning, in visuo-spatial construction, in problem solving, and what exactly is its contribution to the respective tasks? Is it a passive storage system in the sense of an extended sensory store or is it equipped with specific processing components? Finally, the question of distinguishing between genuine visuo-spatial functions and amodal executive functions is not at all solved. It is the aim of this symposium to present and to discuss recent results that touch the questions above. Behavioral and neuropsychological research in the field is included to integrate knowledge on the functional level as well as knowledge concerning the neural realization. In addition, a variety of experimental paradigms is included that may help to provide converging evidence about the system's functionality rather than knowledge about the treatment of a specific experimental task.

Department of Psychology, Saarland University, P.O. Box 151150, D-66041 Saarbrücken, Germany

[S-51] Cache-ing in on working memory: The case of mental synthesis.

One approach to theory development in cognition is to provide accounts for task performance. This approach runs the risk of generating a plethora of models each unique to a given task. An alternative is to use converging operations to develop theories of cognitive function which might then be used to account for performance on a range of tasks and allow for individual variability in which cognitive functions might be employed on any one occasion. This paper will describe some recent studies in which dual-task methodology was used to explore the role of working memory in mental synthesis, a task in which participants attempt mentally to combine named shapes into an image of a recognisable object. Participants appear to recruit several components of cognition, specifically activation of stored knowledge, an executive resource responsible for manipulating images, temporary storage of shape names and transient retention of intermediate mental constructions. The studies illustrate the utility of the working memory framework in accounting for performance in complex cognitive tasks and point to the concept of a visual cache or temporary passive store that is separate from visuo-spatial processing involved in imaginal construction.

Robert H. Logie

Department of Psychology, University of Aberdeen, King's College, Old Aberdeen AB9 2UB, United Kingdom

[S-52] The characteristics of information in visual working memory.

Jerry G. Quinn
Jean McConnell

Based on the current understanding of the VSSP as comprising two components, a passive visual store and an active rehearsal mechanism, recent work by the authors (McConnell & Quinn, in press; Quinn & McConnell, in press) has examined the sensitivities of the components to various types of interference. Results have been interpreted as showing that the passive store is sensitive to a visual noise field which consists of a number of black and white dots. Crucially, there has to be a dynamic aspect to the field or its presentation if interference is to be effected. However, if the dynamic or movement aspect results in a perceptible path being described, the interference is effected through the active rehearsal mechanism. The three experiments to be presented examine further the sensitivity of the passive visual store. It is shown that the complexity of the noise field is significant in the degree of interference caused. Complexity here is defined as the number of dots comprising the noise field. However, varying the size of the field is also shown to have an effect. When size and complexity are directly compared, the results show clearly that complexity is the more significant factor. However, a definition of complexity wholly in terms of the number dots within the field is inadequate.

School of Psychology, University of St Andrews, St. Andrews, Fife KY16 9JU, United Kingdom

[S-53] What is spatial in the visuo-spatial working memory?

One of the main functions which were suggested for the visuo-spatial working memory (VSWM) is the role of a short-term store for spatial information. In accordance to this, the Corsi test in which sequences of locations have to be recalled was often used to investigate the VSWM. However, in this test not only spatial information has to be recalled, but moreover spatio-temporal information. It was our aim to contrast these two types of information. For this purpose, we utilized a spatial relocation task as a pure spatial test, i.e. without a temporal component, and the Corsi task as a spatio-temporal test. Subjects studied four items which were sequentially presented on four different spatial locations. They had to recall these targets after a retention interval of 10 seconds in one of the two tests. Additionally, during the retention interval, we gave one of two secondary tasks. We presented visual noise (Exp. 1 and 2), which has mainly a spatial component, or we realized a spatial tapping task (Exp. 3 and 4) which has a clear spatio-temporal component. Visual noise impaired none of the two tests, whereas tapping caused interference with the Corsi test, but not with object relocation.

Hubert D. Zimmer
Harry Speiser

Department of Psychology, Saarland University, P.O. Box 151150, D-66041 Saarbrücken, Germany

[S-54] What are the modules? fMRI studies on visual working memory.

Axel Mecklinger
Volker Bosch
Christin Grünewald

Although a large number of neuroimaging studies have identified working memory related activations in the prefrontal cortex, the issue of what specific functions these activations reflect and how prefrontal regions interact with other brain regions is still unresolved. We used event-related fMRI to examine the brain regions that support working memory for spatial locations and for three object types: abstract objects, faces and butterflies. All four information types activated an anterior-posterior network including posterior parietal, premotor and prefrontal regions (banks of the inferior precentral and inferior frontal sulcus and preSMA). This network was left lateralized for the three object contents and right lateralized for spatial locations, indicating differential hemispheric involvement for object and spatial working memory processes. Moreover, longer retention times (Experiment 2) led to a greater prefrontal activation but did not affect the posterior parietal activation pattern. This latter result suggests a functional segregation of the working memory network components with posterior parietal areas being more involved in creating perceptual representations and the frontal regions being more concerned with various memorization functions in visual working memory.

Max Planck Institute for Cognitive Neuroscience, Stephanstrasse 1a, D-04103 Leipzig, Germany

[S-55] Spatial marking deficit as a consequence of hypoxic brain damage: A single case study.

Deficits of spatial attention are a frequent consequence of brain damage especially with right posterior parietal and lateral prefrontal lesions. Most of the patients show specific kinds of inattention leading to a neglect of stimuli or to a neglect of stimulus elements. Neglect is not a unitary deficit, but all facets lead to stimulus detection or reproduction deficits. However, stimulus detection and reproduction is not the only function that spatial attention must provide. Spatial marking is a second function which is equally important, for instance, to prevent inefficient search strategies or the repetitive application of actions to objects that have already been processed. M. K. is a patient who is unable to mark spatial positions. His deficits are demonstrated with a counting task and a spatial monitoring task which consistently show that his performance drops to chance level whenever the marking of objects fully depends on spatial information. Alternative ways to mark objects as already processed are considered, the role of elementary visual processes for the marking deficits are analyzed and the integretation of the spatial marking function in a working memory model is discussed.

Gilbert Mohr

Psychology, Saarland University, P.O. Box 151150, D-66041 Saarbrücken, Germany

[S-56] Neocortical areas underlying visual short-term memory: Evidence from fMRI.

Mark W. Greenlee
I. Reinvang
S. Magnussen
F. M. Kraemer

Gradient-echo, echo-planar imaging (EPI) was used to investigate BOLD contrast effects in visual cortex and associated areas in temporal, parietal and prefrontal cortex evoked during a short-term visual memory task. Our aim is to identify neocortical areas involved in the encoding and retrieval of simple patterned stimulus information. The task was to judge the relative spatial frequency difference ($\pm 20\%$) between the standard and the test stimulus. The following conditions were compared: Simple response to test stimulus ("Respond to second vertical"). Choice discrimination of relative spatial frequency of standard and test stimuli ("First stimulus higher or lower than second stimulus"). Our findings indicate that occipito-temporal, parietal, anterior cingulate and prefrontal areas show significant BOLD contrast when the subject judges the spatial frequency of stimuli presented among distractors. This network of responses could represent the activity associated with nonspatial working memory in tasks with sequential presentation of single stimuli.

Department of Neuropsychology & Radiology, University of Freiburg, Breisacherstrasse 64, D-79106 Freiburg, Germany

[S-57] SYMPOSIUM EPISODIC MEMORY.

Johannes Engelkamp

Axel Buchner

The focus of this symposium is on the interplay between item and relational information as assessed by different measures of episodic memory. Two aspects of relational information are considered: order information and categorical information. In the experiments presented at this symposium, a number of different manipulations were used to affect selectively the encoding of item, order, and categorical information. The main manipulations were list structure, bizarreness and frequency of the word materials, perceptual interference at item presentation, encoding instructions, and list composition. With respect to categorical information it was demonstrated that it is used in list recall, how it is used in recall, and that its use does not depend on motivational incentives or on self-perform instructions, whereas it does depend on perceptual interference. The experiments also showed that order information is used in list recall, and they demonstrated how the availability of order information is influenced by list composition, list length, perceptual interference and encoding instructions. One goal of the symposium will be to contribute to integrating the findings in a coherent framework of episodic memory.

Psychology, Saarland University, P.O. Box 151150, D-66041 Saarbrücken, Germany

[S-58] Motivated memory revisited.

Melanie C. Steffens

It is common sense that participants' memory performance should be better if they are especially motivated to excel. Such a possible confounding of motivational and memory factors should, first, be of practical interest to memory researchers; for instance, the effects of specific encoding tasks, as compared to an unspecific intentional learning task, could vary across levels of motivation. Second, if active elaboration and rehearsal are determinants of memory performance, it should be possible to demonstrate effects of motivation to the extent that encoding processes are under participants' control. Surprisingly, empirical research on "motivated memory" is scarce. In one of the few published studies, L.-G. Nilsson (1987, Psych. Research) found that, in contrast to students' expectations, the average memory performance was not higher when a financial reward was offered than when no incentives were given. We identified several reasons why these results may not be readily generalized to other memory experiments. Subsequently, we were able to empirically demonstrate effects of motivation on memory performance. However, there was no effect of motivation on common measures of organisation. If participants' control of encoding processes was reduced by giving enactment instructions, no effect of motivation could be detected.

Psychology, University of Trier, D-54286 Trier, Germany

[S-59] What do we know about what we cannot remember?

When a person fails to retrieve a word from memory, what partial semantic information can he/she still retrieve about it? Two experiments indicated that subjects can gain access to each of the semantic dimensions of the elusive word—evaluation, potency, and activity—with no superiority for the emotional-evaluative dimension. This result was obtained for implicit access, inferred from the kind of commission errors made, as well as for explicit attribute identification. Unlike the retrieval of the full word, the retrieval of partial information seems to share certain characteristics with implicit remembering, as indicated by rate of forgetting and by know/remember judgments. Implications for the feeling of knowing are discussed.

Asher Koriat
Eyal Edry
Gali de Marcas

Department of Psychology, University of Haifa, Haifa 31905, Israel

[S-60] Retrieval mechanisms in free recall of categorized item lists: A multinomial modeling analysis.

Karl-Heinz Bäuml

A three-stage multinomial processing tree model is proposed to account for the free recall of categorized item lists. The model assumes that the successful recall of a category's items is based on three successive stages: the access to a first item of the category, the activation of the category cue, and the access to the category's other items via the category cue. The model is tested against data from two series of experiments in which subjects were presented with either semantically or phonemic-orthographically categorized item lists. Immediately after the presentation of each list a free recall test took place. Across lists both the number of categories (3–16 categories) and the number of items per category (2–8 items) were manipulated. The model provides a good description of the data, thus supporting the proposal that free recall of categorized item lists is mediated through a three-stage retrieval process. The parameter estimates show a number of expected regularities: Access to categories declines with number of presented categories and access to within-category items declines with number of presented within-category items. Beyond these regularities, the parameter estimates indicate that the three putative retrieval mechanisms represent three independent processes of recall.

Institüt für Psychologie, Universität Regensburg, D-93040 Regensburg, Germany

[S-61] The perceptual-interference effect and the item-specific-relational distinction.

Neil W. Mulligan

Interfering with the perceptual processing of a stimulus can improve memory. I have conducted a series of experiments investigating the perceptual-interference effect from the perspective of the item-specific-relational encoding distinction and the order-encoding hypothesis. This perspective suggests that perceptual interference enhances item-specific encoding but disrupts the encoding of relational and order information. The results of several experiments are consistent with this perspective. Perceptual interference, a hypothesized item-specific manipulation, and list organization, a relational manipulation, both enhanced free recall but had opposite effects on a measure of relational processing (category clustering). Increasing list organization increased clustering whereas perceptual interference decreased clustering. Perceptual interference also decreased memory for order. In addition, when order information was an important determinant of free recall, the perceptual-interference effect was eliminated or reversed. When reliance on order information was lessened, the perceptual-interference effect reemerged. Further support for this analysis comes from two experiments using multiple recall tests (i.e., a hypermnesia design). Prior research indicates that item-specific processing increases item gains across tests, whereas relational processing protects against item losses. Consistent with the item-specific-relational framework, perceptual interference produced significant increases in both item gains and losses relative to a control condition. General implications of these results for the item-specific-relational framework will be discussed.

Department of Psychology, Southern Methodist University, Dallas, TX 75275-0442, USA

[S-62] Item, order and categorical information in episodic memory of self-performed and watched actions.

Johannes Engelkamp

Psychology, Saarland University, P.O. Box 151150, D-66041 Saarbrücken, Germany

Memory for self-performed actions (SPTs) can be better than memory for other-performed actions (EPTs). There are, however, some boundary conditions for this SPT advantage: The advantage is observed when the SPT versus EPT manipulation is implemented as a within-subject factor, and when the list length is greater than 24 items. In my laboratory, we have conducted a series of experiments to study the SPT advantage from the perspectives of item-relational encoding (e.g. Hunt & Einstein, 1981) and item-order encoding (e.g. Nairne, Riegler, & Serra, 1991). None of these positions implies list length restrictions, and they were formulated independently of each other. As for SPT and EPT encoding, we proposed (1) that SPT provides better item information than EPT, (2) that EPT provides better order information than SPT, (3) that categorical information does not differ between SPT and EPT, (4) that—in accordance with the order-encoding framework—order information should suffer when the SPT versus EPT manipulation is implemented as a within-subject factor, and (5) that the order-encoding hypothesis is confined to short lists (< 10 items). In order to test these assumptions, we manipulated encoding instructions (EPT vs. SPT), list length, list structure (categorically related vs. unrelated) and type of design (within vs. between). Memory performance was measured in several ways (free recall, organisation, order reconstruction, recognition). The findings from these experiments were consistent with our assumptions and will be discussed with regard to a general framework of item and relational (order as well as categorical) information.

[S-64] SYMPOSIUM
FROM PTOLEMY TO PSYCHOLOGY: CONSTRAINTS ON INTERPRETING SPATIAL REPRESENTATIONS.

Merideth Gattis

A rich historic tradition of spatial representations for communicating knowledge, history, and belief—ranging from maps, stained glass windows and picture bibles, to more recently developed graphing systems, flow charts, and graphical user interfaces—suggests an interesting question: Are the cognitive processes involved in interpreting spatial representations like the processes involved in scene recognition, reading, or neither? This symposium will examine whether interpreting spatial representations is a privileged cognitive process relying on natural cognitive constraints, much like scene recognition; a process of mastering an arbitrary graphical system, like reading; or something altogether different. Whereas written language is largely arbitrary, requiring instruction to master, spatial representations may accomodate correspondences between the represented and the representation, allowing untutored "readers" to rely on natural cognitive constraints in the interpretation process. Spatial representations are also highly schematized, however, which may cause interpreting spatial representations to be more complex than scene recognition. The talks in this symposium examine hypothesized constraints on the interpretation of spatial representations, and present new empirical evidence for and against the existence of such constraints.

Department of Psychology, University of Sheffield, Western Bank, S10 3BW Sheffield, United Kingdom

[S-65] Localization constraints in schematic and topographic maps.

Alexander Klippel

Department for Informatics and Doctoral Program in Cognitive Science, University of Hamburg, Vogt-Kölln-Strasse 30, D-22527 Hamburg, Germany

Maps are common means for representing geographic knowledge. To understand the different possibilities of representing spatial aspects of geographic knowledge in maps it is useful to juxtapose schematic maps (for example, underground maps) and general reference maps (i.e. topographic maps). The content of both map types is derived from the same sources of information. Despite this similarity in origin, the localization of cartographic entities in topographic maps is defined by rules, for instance the use of a certain projection, whereas the need for defined localization is relaxed in schematic maps. This relaxation of localization constraints in schematic maps relates to other differences between the two kinds of maps as well. The formal description of the differences between schematic and topographic maps enables the evaluation of computational efforts of each map type and provides a basis for psychological experiments. The first step in formal description is the characterization of spatial relations in schematic and topographic maps along the following distinctions: Topology, ordering information, metric, and euclidic geometry. This provides distinctive features of the geometric richness of each map type. Further investigations concerning reference systems are founded on this initial formal description. We give an account of the correspondence between geometric characterization of map types and interpretation principles.

[S-66] Graphical user interfaces and perceptual constraints.

Constanze Vorwerg

Human-computer interfaces often involve graphical representations of spatial relations. Using 3D computer graphics, spatial relations in 3D space can be represented, which may be essential in domains like CAD, three-dimensional structures in bioinformatics, geographical information systems, complex data visualisation, ... However, hitherto it is largely unknown whether spatial-cognitive performance in virtual environments represents an adequate model for spatial-cognitive performance in real environments. In several experiments investigating the mapping of spatial relations in vision and language, pairs of objects were stereoscopically represented in graphical user interfaces (using stereo glasses) with either WIMP (Windows, Icons, Menus, and a Pointing device) or a virtual reality output device. Results show the effectiveness of perceptual principles in the processing of spatial relations represented in GUI. These phenomena include the perceptual saliency and preference of certain orientations and their role in categorizing spatial relations as well as the mapping of vertical on horizontal space and vice versa. A positioning experiment revealed the use of sagittal and lateral orientations as imaginary reference lines. Interestingly enough, the orientation of the reference object exerts an influence on the perception of the sagittal axis in a rod-and-frame illusion manner: the apparent sagittal axis tends to be displaced in direction of the rotated object's main axis with small rotation angles, in the opposite direction with larger rotation angles (the inverse relation holds for the Aubert phenomenon). Results are discussed with regard to perceptual constraints on the interpretation of spatial representations and their significance in combining visual spatial representations with natural language.

University of Bielefeld, P.O.Box 100131, D-33501 Bielefeld, Germany

[S-67] Preschool children's understanding of spatial representations.

Caroline Shevelan

Young children's ability to relate spatial representations to the environment has been extensively debated. Research suggests that pre-school children cannot use spatial relationships between map symbols to distinguish identical places. Others suggest children can do this before starting school. However this contradiction may reflect the differing complexity of tasks and materials used by research groups which place different demands on young children's cognitive capacities. In response to this, seventy children aged three, three and a half and four were presented with a large model environment and three representations of the environment: a map, a scale model, and an aerial photograph. The model contained four identical houses. Children watched as the experimenter placed a sticker on one house in the representation. They were then asked to post their letter in the same place in the model. Each child was tested with all three representations in counterbalanced order. The results show an age linked development in children's ability to use spatial position which reflects the relational shift seen in analogical reasoning development. The type of representation used has no effect on performance when instructions and task factors remain constant, suggesting that previous results reflect the differing demands made on children's cognition.

Department of Psychology, University of Sheffield, Sheffield S10 2TP, United Kingdom

[S-68] Perceptual and linguistic polarity constrain reasoning with spatial representations.

Reasoning with spatial representations involves attaching meaning to them, a process that is achieved by mapping correspondences between abstract concepts and a spatial representation. Two obvious cognitive constraints govern the process of mapping: iconicity and associations. Iconicity constrains the interpretation of spatial representations when a representation preserves some perceptual characteristics of what it represents, either by maintaining similar perceptual features, or similar perceptual relations. Associations constrain mapping when a perceptual property acts as a communicator or reminder of previously acquired associations between perceptual characteristics of the spatial representation and meaningful characteristics of the concept being represented. In both cases mappings are based on experience and are rooted in perception. Iconicity and associations are insufficient, however, to account for the range and flexibility of human performance in reasoning with novel spatial representations. I will argue that some mappings of concepts to spatial representations are based not on specific experience but on similarity of organizational structures between the spatial representation and the concept being represented or reasoned about. I will present evidence that polarity—a constraint based on asymmetric oppositional structure—also drives the mapping process. Mappings based on polarity appear not to require specific prior experience, and are highly conducive for depicting abstract concepts.

Merideth Gattis

Jane Molyneaux

Department of Psychology, University of Sheffield, Western Bank, S10 3BW Sheffield, United Kingdom

Chapter 4

THEMATIC SESSIONS

[1] Hearing by eye: How much spatial degradation can be tolerated?

Spoken syllables that are recognisable if presented in auditory modality only, become misperceived if paired with incongruent visible speech (McGurk & MacDonald, 1976). An important question relates to the spatial scale of the visual information sufficient to cause the McGurk effect. By systematically increasing the coarseness of visual information in incongruent audiovisual displays (the mosaic-transform of videotaped images was used), we found that the effect gradually diminishes, however tolerates quite strong levels of visual degradation. Even with the coarsest level of degradation (11.2 pixels/face, 4.4 pixels/mouth) allowing generally correct auditory categorical perception, the clarity ratings were lower than in the unimodal control condition. A discontinuity in the increase of the strength of the effect was observed between 19.4 and 14.2 pixels/face, levels, reminiscent of a similar effect in visual identification (Bachmann, 1991; Bachmann & Kahusk, 1997). We conclude that (1) audiovisual interaction involves primarily intermediate and coarse spatial levels (which is expedient, considering the speed of speech processing); (2) the quality of auditory representation varies as a function of intermodal visual influence even with invariant auditory categorical perception; (3) a critical spatial scale level of visual representation may exist beyond which the optimum conditions for visual-auditory interaction are lost.

Talis Bachmann
Søren Andersen
John MacDonald

Department of Psychology, University of Portsmouth, King Henry I Street, Portsmouth PO1 2DY, Hampshire, United Kingdom

[2] Developmental amnesia: Implication for the structure of LTM.

Alan Baddeley
Faraneh Vargha-Khadem
Mortimer Mishkin

We describe a new type of amnesic syndrome that appears to result from a severe restriction to the development of the hippocampus, probably resulting from perinatal anoxia. A single case study of a young man, Jon, will be described. Despite gross memory impairment from an early age, Jon has developed normal intelligence and semantic memory, presenting a puzzle for standard accounts of the amnesic syndrome. We present evidence from six experiments indicating that recognition memory is spared. However, this capacity to 'remember' in the sense of recollecting the experience of learning appears to be absent. Jon's pattern of forgetting will be described, and the implications of these results for the nature of semantic memory discussed.

Department of Psychology, University of Bristol, 8 Woodland Road, Bristol BS8 1TN, United Kingdom

[3] Working memory capacity and executive functions in language interpretation.

Maria Teresa Bajo

Prior experiments on working memory usage have shown that professional interpreters are able to analyse the linguistic input, access the mental lexicon, access semantic representations and translate at the same time that they produce the translated segment. Comprehension and translation are performed under conditions of simultaneity and of temporal pressure and this can only be done with a very efficient use of their working memory capacity. The experiments that we present focus on different aspects involved in language understanding and their relation to working memory. In our experiments, professional interpreters, students of interpretation and control subjects performed a series of tasks involving working memory. Previous studies have shown differences between professional interpreters and control subjects in digit/phrase span tasks and in tasks involving linguistic processing. Our first experiment tried to explore if these superior linguistic abilities were due to the interpreters' large memory capacity. Our subjects had to verify ambiguous words at the same time that they held in memory 0, 7 or 9 digits. We also measured working memory capacity by introducing a phrase span task. Our second experimental series tried to determine the role of working memory's central executive on the efficacy of the interpreters' memory processes. Results of previous experiments have shown that the interpreters are able to perform recall tasks, while their articulatory loop is blocked. In these experiments, random letter generation updating and supression tasks were used to explore the role of the central executive. These three tasks have been assumed to involve executive functions that are necessary for linguistic processing.

Departamento de Psicología Experimental, Campus Universidad de Cartuja, Universidad de Granada, E-18011 Granada, Spain

[4] Psychological refractory period and aging.

Guido P. H. Band

Older adults are known to respond slower than young adults. Furthermore, several studies suggest that central computational processes, such as stimulus-response translation, are more susceptible to age-related slowing, and that older adults are more disturbed by an increased need for cognitive control. These predictions were tested with young adults and two groups of older adults (60-70y and 70+) in the Psychological Refractory Period (PRP) paradigm. This paradigm requires two responses to two separate choice-stimuli (auditory and visual) that follow each other after 150–1100 ms. The literature suggests that a delay of the second response reflects a temporary inaccessability of a bottleneck process due to the ongoing translation of the first stimulus. Preliminary analyses showed that the typical PRP effect, a delay in the second response, occurred for young and old adults. However, the PRP effect remained for later onsets of the second stimulus for old, but not for younger adults. This delay by age interaction suggests that older adults have a specific delay of the bottleneck process, typically assigned to response selection.

Psychonomics section, University of Amsterdam, Roetersstraat 15, NL-1018 WB Amsterdam, The Netherlands

[5] Is attention object-based for non-spatial responses but spatial-based for aiming movements?

Harold Bekkering

Jay Pratt

A strong debate is going on whether visual selective attention is a space-based or object-based process. Accumulating evidence from a broad spectrum of science (e.g., single-cell recording, patients with neglect) suggest that object-based attention is associated with a response enhancement at the earliest level of the visual cortical processing hierarchy. Nevertheless, actions which have effects in the external world, must be somehow spatiotopically represented in the brain. In the present study a cue (70% valid) was presented at one of four ends of two parallel rectangles. The invalid trials were either within the object or equidistantly outside the object. For non-spatially directed button-presses (Experiment 1), invalid trials were found to be faster within the object than outside the object. However, this effect was not present for pointing movements (Experiment 2) nor for grasping movements (Experiment 3). Moreover, pointing movements (Experiment 4) showed a cueing effect for direction, i.e., latencies were shorter if the target appeared at the same angle as the cue compared to when the target appeared equidistant from the cue at another angle. Together, the results suggest an object-based effect for non-spatial responses, but a spatial-based effect (i.e., direction) for spatially directed aiming movements.

Max Planck Institute for Psychological Research, Leopoldstraße 24, D-80802 Munich, Germany

[6] Integration of knowledge on sentence comprehension measured by reaction times and pupil dilation.

Reinhard Beyer
Thomas Guthke
Frank Kruger
Rene Mehlau

The main question of our recent investigations concerns the assumption of an activation of knowledge during sentence comprehension. Hypotheses are derived from models of Klix, van der Meer (1992) and Kintsch (1993). A specific word recognition paradigm was applied in three experiments in order to test the assumptions. First the subjects had to read a sentence and afterwards a test word. The subjects were required to decide, whether or not the test word had been part of the sentence. We varied the type of relation between sentence and negative test word (neutral vs. semantic). The data support the assumption of activation of semantic knowledge. We found longer rejection times on the recognition task for negative semantic related test words. Next we varied the type of semantic relation (prospective vs. retrospective relations) within the same paradigm. We found a specific time order in activation dependent on relation type and an interesting correspondence between semantic relatedness and the pupil dilation during test word processing. We introduced different subject populations in a last experiment (e.g., patients with brain injuries located in the left or right hemisphere) and noticed a specific modification of the result patterns in our recognition paradigm.

Department of Psychology, Humboldt University Berlin, Oranienburger Straße 18, D-10178 Berlin, Germany

[7] Multidimensional situation models.

Mental representations readers elaborate from texts reflect the situation described. To construct a coherent mental representation of the story world, readers have to monitor the multiple dimensions implied by the situation. According to the event-indexing model (Zwaan, Langston & Graesser, 1995), the story events are connected in memory through at least five dimensions: Protagonists and objects, temporality, spatiality, causality and intentionality. In three first experiments, we mainly investigated whether readers monitor the protagonist's attitudes and intentions even when the text foregrounds the spatial dimension. Results provided evidence that readers differentially monitor the situational dimensions. It also appeared that the multidimensional content of the situation model seems to be sensitive to readers' prior knowledge and task demands. In a fourth experiment, we deeply examined the effects of these two factors on the monitoring of each situational dimension and the results showed that readers' prior knowledge and task demands determined the situational dimensions to foreground. We also noticed that the multidimensional content of the situation model tends to vary as readers proceed through the text and, in a last experiment, we furnished further support to this dynamic aspect of situation models.

Nathalie Blanc

Isabelle Tapiero

Laboratory of Cognitive Psychology, University of Lyon 2, 5 avenue Pierre Mendes-France, F-69676 Bron cedex, France

[8] The bimanual production of drawing patterns with spatial incompatibilities.

Hedwig Bogaerts
Stephan P. Swinnen

It has been documented repeatedly that the simultaneous performance of two-dimensional perceptual-motor tasks with both upper limbs is subject to interlimb interactions. These interactions affect the phase-relationship between the limbs as well as the quality of the individual drawings, although preexisting or preferred patterns lead to a more successful execution than less preferred or new coordination patterns. Preferred coordination patterns are characterized either by a co-activation of homologous muscle-groups and/or by an iso-directional movement path of both limbs. This suggests that spatial parameters constitute a primary interlimb coordination constraint. The role of movement direction was studied in more detail in the present experiment in which right-handed subjects (N= 12) were to draw different configurations of two equilateral (either positioned horizontally or vertically) triangles on a double digitizer-setup. In addition to the preferred coordination patterns, new patterns in which the left hand was lagging the right hand with one side of a triangle had to be produced. This resulted in the simultaneous production of incompatible movement directions. As expected, the latter coordination patterns resulted in a less accurate and consistent phase-relationship, and the quality of the triangles deteriorated dramatically ($p < .01$). The findings are discussed in relation to the role of movement direction in constraining patterns of interlimb coordination. The spatial interference between upper limbs increases when both movement paths are oriented neither in an equal nor in a parallel fashion.

Laboratory of Motor Control, Department of Kinesiology, University of Leuven, Tervuursevest 101, B-3001 Heverlee, Belgium

[9] Long-term priming for written words is a by-product of learning within the orthographic system.

A series of experiments is described that attempts to better characterize the representations and processes that support long-term priming for written words. Priming for low-frequency words is shown to reflect a change in sensitivity in perception rather than pure bias, as a number of authors have maintained (e.g., Ratcliff & McKoon, 1997). Furthermore, priming is shown to be mediated by abstract orthographic representations that map together visually dissimilar exemplars of letters and words (e.g., the letters A/a map onto a common abstract letter code a*). Based on these findings, it is argued that priming is best understood as an incidental by-product of learning within an orthographic system that codes information in an abstract format. Long-term priming is modeled in a connectionist model of single-word reading.

Jeffrey Bowers

Department of Psychology, University of Bristol, Bristol BS8 1TN, United Kingdom

[10] Arctic cognition: A study of cognitive performance in summer and winter at 69 degrees N.

Tim Brennen
Monica Martinussen
Bernt-Ole Hansen
Odin Hjemdal

Evidence has accumulated over the past 15 years that affect in humans swings over the annual cycle. In winter there is a tendency to depression, with remission in summer, and this effect is claimed to be stronger at higher latitudes. In order to determine whether human cognition is similarly rhythmical, this study investigated the cognitive processes of 99 participants living at 69 degrees north. Participants were tested in summer and winter on a range of cognitive tasks, including verbal memory, face recognition, attentional tasks, time estimation and simple reaction time tasks. The seasonally-counterbalanced design and the very northerly latitude of this study provide optimal conditions for detecting any impairments of cognitive performance in winter. The large database gives no grounds for concluding that cognitive performance in winter is worse than in summer. Indeed some aspects of the data suggest an advantage in winter, with quicker responses on simple tasks reaction time and reduced confusability. These results are consistent with those from studies of the menstrual cycle, where there is also a dissociation between effects on mood and effects on cognition.

Department of Psychology, University of Tromsø, N-9037 Tromsø, Norway

[11] Negative priming in temporal order judgements about auditory stimuli.

Reactions to previously ignored stimuli are slowed down relative to reactions to new stimuli. One account of this negative priming effect is that the distractor stimulus representation is actively inhibited which slows down reactions when that distractor subsequently becomes a target. According to another account, attending to a previously ignored stimulus cues the retrieval of the previous processing episode which contains the information that no response was to be made to that stimulus. This no-response information interferes with the generating of a response to the stimulus when it is later presented as a target. In an attempt to distinguish between both accounts, subjects in one experiment were asked to respond manually to auditory stimuli as in a typical negative priming task, whereas in a second experiment they simply judged which of two stimuli appeared first. Such temporal order judgements should reflect whether a stimulus had previously been ignored only if ignoring implied an inhibition of the representation of the ignored stimulus. In contrast, if conflicting no-response information was the sole cause for the typical slow-down in manual reactions, then no effect of ignoring should be reflected in the temporal order judgements. The results were compatible with the inhibition account.

Axel Buchner

Psychologie, Universität Trier, D-54286 Trier, Germany

[12] Directed forgetting in probable Alzheimer's disease: Failure to find failure of inhibition.

Romola Bucks
Martin Conway

Recent evidence suggests that breakdown of inhibition may be important to the cognitive dysfunction of AD, perhaps due to cholinergic deficits affecting attention. Younger, middle-aged, older and AD participants were assessed using a directed forgetting paradigm. In the F condition, participants were instructed to remember all words shown them, then given a mid-list cue to forget the first half of the list (TBF) but remember the second (TBR). In the R condition, participants were instructed to remember all words. Participants were instructed to recall items from both lists, and then recognition of the words was assessed. Evidence for a DF effect is shown by a low number of intrusions in free recall of the TBF items and improved recall of the TBR items, with intact recognition of both. Contrary to prediction, neither healthy older nor AD participants intruded significantly more TBF words than healthy younger or middle-aged participants. Additionally, all the groups recalled more of the TBR items, and there were no differences in the proportion of target words correctly recognised suggesting that the TBF items had been inhibited rather than lost. An explanation for these findings will be offered which takes account both of methodological and theoretical factors.

Bristol Memory Disorders Clinic, The BRACE Centre, Blackberry Hill Hospital, University of Bristol, Manor Road, Bristol BS16 2EW, United Kingdom

[13] Selectivity in selective attention.

We studied effects of color cueing on Stroop performance. In every trial a fixation colored figure was followed by a Stroop stimulus. The color of the fixation figure did not predict the stimulus color (25% validity). All conditions were mixed within blocks. Subjects focused on the fixation figure, and named the color of the Stroop stimulus. There was a significant fixation color effect for incongruent trials when: a) The fixation color and the word's color matched, RTs were longer than when they did not match, irrespective of SOA (i.e., an inhibitory effect). b) When the fixation color and the word's meaning matched, responses slowed down under long but not under short SOAs. There was no fixation color effect in neutral Stroop trials. The fixation color effect in the incongruent trials is similar to the negative priming effect. Note however, that it is achieved when there is no need to apply any response to the fixation figure. In addition, the lack of fixation color effect in neutral Stroop trials deviates from findings reported in the negative priming literature: There was no positive priming which was expected for such no-selection conditions.

Ziv Chorev
Avishai Henik

Department of Behavioral Sciences, Ben-Gurion University of the Negev, P.O.Box 653, Beer Sheva, Israel 84105

[14] Feature integration and object recognition: Different visual systems.

Asher Cohen
Rachel Shoup

Feature integration theories typically assume that binding of features from different dimensions (e.g., color and orientation), and binding of two line orientations (e.g., discriminating between L and T) are performed by the same mechanism. Moreover, it is often assumed that both types of binding are needed for identification of visual objects. We describe experiments that compare these two types of binding. The experiments demonstrate that different mechanisms are required for cross-dimensional and for line orientation bindings. On the basis of these experiments as well as earlier studies from our lab we speculate that conjunctions of line-orientation targets are determined by the visual object recognition system, whereas conjunctions of features from different dimensions may be performed by a different system that is closely associated with response selection processes.

Department of Psychology, The Hebrew University, Mount Scopus, Jerusalem, Israel

[15] Are colour categories universal? Replications and new evidence from as stone-age culture.

A series of experiments sought to replicate and extend the work of Rosch Heider on the Dani of New Guinea with a comparable group from Papua New Guinea who speak Berinmo, a language with 5 basic colour terms. Rosch Heider's classic results have been widely interpreted as showing clear support for universality. The Dani seemed to have much the same cognitive representation of colour as Americans, even though they appeared to have only two basic colour terms. Some of Rosch Heider's key results could, however, be interpreted as supporting linguistic relativity rather than universality. Three experiments investigated naming and recognition memory. Results were only superficially the same as those found by Rosch Heider for Dani subjects. Experiment 1 found that recognition was affected by colour vocabulary; we point out that similar conclusions can be drawn from the original research. In Experiment 2, we found that the advantage for focal colours derived from a response bias for Berinmo subjects. In Experiment 3, examination of paired associate learning for a set of coloured stimuli also failed to show the advantage present in Rosch Heider's data for focal stimuli. Four new experiments confirmed the linguistic influence on the organisation of colour categories.

Jules Davidoff
Ian Davies
Debi Roberson

Department of Psychology, University of London, Goldsmiths College, New Cross, London SE14 6NW, United Kingdom

[16] Ideomotor action—A new chapter.

Sara De Maeght
Lothar Knuf
Wolfgang Prinz

Ideomotor phenomena form an interesting class of events in which movements are induced by contents of perception, e.g., observing the activity of another person or a physical object. A classical example is the accompanying feet movements made while watching an exciting scene in a game of soccer. Two possible explanations express how these body movements can be induced by the course of events: 1. perceptual induction: we perform what we see, and 2. intentional induction: we perform what we would like to see. In order to study these phenomena we constructed a billiards-like computer game. Each trial started with an instrumental phase, in which the subject could influence the events and was followed by an induction phase, in which he/she could only observe the outcome of the own action. The movements of head, hand and foot showed a clear preference for intentional induction. Under certain circumstances, however, perceptual induction was observed superimposed upon the intentional induction. In another experiment, the subjects were involved in a tracking task, which did not have an effect on the course of events in the billiard-scene. As such, we were able to study PURE induced movements. Again, the data showed evidence for both induction principles.

Unit for Cognition & Action, Max Planck Institute for Psychological Research, Leopoldstraße 24, D-80802 München, Germany

[17] How to go from A to B? A cognitive approach to the production, comprehension, and use of route directions.

Michel Denis

A growing interest has been expressed in the recent years for understanding the functional relationships between language and spatial cognition. In close connection with efforts developed in linguistics and artificial intelligence, cognitive psychology offers theoretical and empirical accounts of the ways by which spatial knowledge is expressed in the form of spatial discourse, as well as those by which people build representations of unfamiliar environments from verbal descriptions. The set of experiments to be reported here concentrates on the processes by which speakers or writers provide navigational assistance in the form of route directions, and tries to identify those features that make spatial discourse efficient. Converging measures, such as judgments of clarity, memory for verbal instructions, and navigational performance, provide validation for a cognitive model of spatial discourse. Neuroimaging approaches also provide indications on the brain structures involved in the mental representation of spatial environments from verbal descriptions.

Groupe Cognition Humaine, LIMSI-CNRS, Université de Paris-Sud, BP 133, F-91403 Orsay Cedex, France

[18] Dissociating conscious and unconscious influences in sequence learning.

Arnaud Destrebecqz
Axel Cleeremans

Can we learn without awareness? Albeit this issue has been extensively addressed in the field of implicit learning, there is currently no agreement about the extent to which knowledge can be acquired and projected onto performance in an unconscious way. The controversy, as in the case of implicit memory, seems to be at least partly attributable to unquestioned acceptance of the unrealistic assumption that tasks are process-pure, that is, that a given task involves exclusively implicit or explicit knowledge. Methods such as Jacoby's Process Dissociation Procedure (PDP) have therefore been developed to overcome the conceptual limitations of the process purity assumption. In this paper, we show how the PDP can be adapted to obtain separate estimates of explicit and implicit knowledge acquisition in a sequence learning experiment. We show that providing subjects with increasing amounts of explicit knowledge has differential effects on the estimates of implicit and explicit influences. Finally, we show that a modified simple recurrent network (SRN) is able to capture our dissociation results even though it is based on a single processing pathway. The model therefore suggests that (1) the observation of dissociations does not necessarily entail separate underlying knowledge bases or processing systems, (2) the implicit/explicit dimension is best seen as a continuum rather than as a dichotomy.

Séminaire de Recherche en Sciences Cognitives, Université Libre de Bruxelles, 50 Avenue F. D. Roosevelt, CP122, B-1050 Bruxelles, Belgium

[19] Model construction strategies in linear temporal reasoning.

It has frequently been demonstrated that linear syllogisms are solved by constructing, in working memory, an integrated mental representation (mental model) of the information present in the premises. On the basis of this mental model, a putative conclusion of the syllogism is generated. Subsequently, this conclusion is validated by verifying whether other mental models, refuting the putative conclusion, can be built from the same premise information. Following the multi component working memory model of Baddeley and Hitch (1974), the mental model can be constructed by means of different verbal or visuo-spatial encoding procedures. The present study shows that the process of constructing the mental model depends on strategic decisions. Experiments will be reported that show that the choice between different model construction strategies (repetition, acronym formation and visuo-spatial strategy) is guided by a weighing of the accuracy and the amount of resources used by the strategies. The selected model construction strategy leads to the most accurate conclusions requiring minimal resources. Moreover, people are found to be perfectly able to switch between strategies adaptively to changing premise term features. These results question the recent claim that the model construction phase passes automatically.

Vicky Dierckx
André Vandierendonck

Department of Experimental Psychology, University of Gent, Henri Dunantlaan 2, B-9000 Gent, Belgium

[20] Saccadic target selection during visual search.

Mieke Donk
Richard Godijn
Harold Bekkering

Previous visual search studies have either shown that the target selection of saccadic eye movements is determined by element saliency and controlled in a bottom-up fashion, or that it is determined by preknowledge of target identity and controlled in a top-down fashion. In this study a direct comparison was made between bottom-up and top-down control of saccadic target selection. Participants were to make a speeded saccade towards a target with a specific orientation, amidst a number of nontargets and one distractor. Distractor-target and distractor-nontarget similarity were varied. The proportion of correctly directed initial saccades [p(correct)] was higher when target and distractor were dissimilar than when they were similar, providing evidence for top-down control. Also, p(correct) was higher when the target was more salient than the distractor, than when the distractor was more salient than the target, especially when saccade latency was low. This provides evidence that bottom-up control also plays a role in saccadic target selection. Results further show that bottom-up control decreases and top-down control increases as a function of saccade latency.

Department of Cognitive Psychology, Vrije Universiteit Amsterdam, De Boelelaan 1111, NL-1081 HV Amsterdam, The Netherlands

[21] Semantic priming from parafoveal words.

We studied semantic priming from parafoveally presented words in a lexical decision task while varying the attentional load of the central task. With successive presentation of the prime and the central target at a stimulus onset asynchrony (SOA) of about 1000 ms, priming words presented 2.5° above and below fixation were always unreportable and never had any influence on the lexical decision. We expected more readable primes, presented at 0.8° from fixation, to induce a positive semantic priming effect. However, this was the case only when fixation during the prime display was left vacant. Comparable results were found with shorter SOAs of the prime (at 0.8° from fixation) and the target: with a 0-ms SOA no priming effect was obtained. When the primes preceded the target by 200 ms, however, a positive priming effect emerged, provided the central position of the prime display was left empty rather than filled with # signs for the SOA duration. One of the major factors limiting the positive priming potency of reportable parafoveal words seems to be the perceptual load of the central component of the prime display, which is in accordance with the ideas proposed by Lavie (1995).

Katia Duscherer

Daniel Holender

Laboratoire Psychologie Expérimentale, Unviversité Libre de Bruxelles, CP. 191, 50, avenue F. D. Roosevelt, B-1050 Brussels, Belgium

[22] Prospective remembering of Korsakoffs and alcoholics as a function of the ongoing task.

Géry d'Ydewalle
Els Brunfaut

Since prospective memory relies mainly on the functioning of the frontal lobes and Korsakoff patients are known to suffer from a general cerebral atrophy and a frontal lobe atrophy in particular, Korsakoff patients are expected to show a considerably impaired performance on prospective-memory tasks. In Experiment 1, the ongoing task was perceptual (counting the number of vowels in a word) and the prospective-memory task semantic (pushing the space bar when the name of an animal appears). Korsakoff patients indeed performed worse than alcoholics. In Experiment 2, the ongoing task was either a counting of the number of vowels in a word (a perceptual task) or explaining the meaning of the words (semantic); the prospective-memory task was again the same semantic task. Experiment 3 used a perceptual prospective-memory task (pushing the space bar when the word counted 5 letters) while the ongoing task was either perceptual or semantic. It appears that Korsakoff patients considerably improve their prospective memory when both tasks, the ongoing and prospective memory tasks, require semantic processing. Semantic analyses of the ongoing task likely provide the patients strong enough prompts to trigger out the requested semantic prospective-memory response.

Department of Psychology, University of Leuven, Tiensestraat 102, B-3000 Leuven, Belgium

[23] Action priming by learned effects under variations of contingency and contiguity.

According to our associative two-phase model of voluntary action, the ability to execute voluntary action is acquired in two steps: In step 1, people acquire associations between movement representations and the representations of events which frequently co-occur with these movements. In step 2, the acquired action-outcome associations can be used to select a movement which is appropriate to achieve a certain action goal. Via the acquired association, the anticipation of an action goal may lead to an activation of a movement that is known to having produced the desired event in the past. If action-outcome learning in step 1 is associative, it should be influenced by variations of the contingency and the contiguity between the movement and the following event. In two studies, we show that presenting a previously learned action effect leads to the priming of the action that is known to produce that effect. The degree of priming varied with the level of contingency and contiguity between action and outcome in the learning phase, suggesting that action-outcome associations are indeed the basis of voluntary action control.

Birgit Elsner

Bernhard Hommel

Max Planck Institute for Psychological Research, Leopoldstraße 24, D-80802 Munich, Germany

[24] Timing in the Corsi Blocks task.

Martin Fischer

The Corsi Blocks task (CBT) measures spatial memory span. Methodological details across previous studies varied considerably, especially with respect to stimulus timing. CBT performance in a standard condition was compared to performance with longer encoding intervals (3 vs. 1 s), or longer memory intervals (9 vs. 1 s). Both of these manipulations lie within the range of previous studies, and both improved performance. Response initiation times provided a useful additional measure of spatial working memory. Implications of these findings for research using the CBT are discussed.

Experimental Psychology, University of Munich, Leopoldstraße 13, D-80802 Munich, Germany

[25] Is there an acrobat in nacrobat: How to juggle with boundary misalignement?

How do listeners cope with misalignments between word and syllable boundaries? Due to "liaison" and "enchaînement" phenomena in French, syllable boundaries frequently don't coincide with word onsets (e.g., "l' + acrobate" (the acrobat) syllabified as /la.kro.bat/). This study used the phoneme-detection paradigm to investigate the effect of onset misalignment on lexical activation. Experiment 1 compared RTs to item-final targets (e.g., /t/) in sequences consisting of a word preceded by an additional consonant ("gacrobate") with matched nonwords ("gopribate"). A baseline condition tested for lexical activation by comparing RTs to a real word ("acrobate") and its control nonword ("opribate"). Results showed faster RTs for the former stimulus than for the latter. Crucially, RTs were faster in "gacrobate" than "gopribate" showing activation of the misaligned word. Experiment 2 tested whether the lexical status of the additional-initial consonant affected the lexical activation of the misaligned word. Sequences similar to those of experiment 1 were compared with words preceded by a "lexical" consonant such as the elided article "l' ". We hypothesized that the lexical information in the consonant creating the boundary mismatch help resolve the misalignment. Implications of these results for lexical segmentation and for theories postulating syllabic units of lexical access are discussed.

Cecile Fougeron
Uli Frauenfelder
Alain Content

Laboratoire de Psycholinguistique, Université de Genève, 9 route de Drize, CH-1227 Carouge, Switzerland

[26] The contribution of metrical cues to the acquisition of an artificial language.

Uli Frauenfelder
Marie-Helene Banel
Pierre Perruchet

This study examines the role of distributional and metrical cues in the learning of an artificial language. French participants first heard a sample of the language (a continuous string of nonce syllables) and then were required to decide whether bi- or trisyllabic items belonged to the language or not. The first group listened to a sample without rhythmic cues—all long syllables—, the second group received the same language with French metrical segmentation cues—alternation of short and long (accented) syllables—, and the third group heard the same language with an inverted metrical structure. The presence of French rhythmic structure but not inverted structure allowed the participants to learn the artificial words. An intermediary level of performance was observed in the absence of metrical cues. The implications of this research for lexical segmentation and language learning are discussed.

Laboratoire de Psycholinguistique, Université de Genève, 9 route de Drize, CH-1227 Carouge, Switzerland

[27] Factors affecting accuracy and speed of search amongst new and old objects.

We will describe a series of experiments in which observers are required to decide on the presence or absence of a target object in a display of non-targets. In some experiments the target is an illusory square containing stationary horizontal lines on a background of downward moving lines; non-targets are illusory squares containing upward moving lines. The comparison of interest is between new and old objects. New objects are those which appear immediately following an auditory signal to search for a target. Old objects have been present on the screen for (usually) 500 ms before an auditory signal to indicate that one of them may become a target. In general, new object targets are detected far more efficiently than old object targets as measured by accuracy of response, but reaction times to them are often slower. Other experiments employ stimuli in which target, non-targets and background are all different shades of grey, and the same effects are obtained. Accuracy and speed data will be discussed in relation to processing capacity limitations and motor inhibition, respectively. We will discuss whether these effects should be considered as attentional or pre-attentional.

Angus Gellatly
Geoff Cole
Anthony Blurton

Department of Psychology, University of Keele, North Staffordshire ST5 5BG, United Kingdom

[28] A supralexical model of morphological processing in French.

Hélène Giraudo
Jonathan Grainger

There is a general consensus among psycholinguists today that morphological information is explicitly represented in the mental lexicon and exploited during language processing. However, there is still much controversy surrounding the way such information is represented. In a generic hierarchically organized model of word recognition where sublexical codes are mapped onto whole-word orthographic and/or phonological codes, and from there to semantics, there are two possible locations for morphemic representations: below whole-word representations (the sublexical hypothesis), or above the whole-word level (the supralexical hypothesis). According to the sublexical hypothesis, a word stimulus is first parsed into its morphological components before the word can be recognized as a whole. According to the supralexical hypothesis, morphemic representations are contacted after whole-word representations and in this way impose an organization on the lower-level form representations in terms of morphological families. Recent data obtained using different priming paradigms are presented in support of a supralexical model of morphological representation for French derivational morphology.

CREPCO & University of Provence, 29 avenue Robert Schuman, F-13621 Aix-en-Provence Cedex 1, France

[29] Rhythmic cues used for speech segmentation in French and Dutch: The role of stress.

While cross-linguistic comparisons are a good way to investigate the speech segmentation cues that are developed from the specific rhythmic regularities of several languages, the differences between experimental situations and stimulus sets across languages do not afford to make such comparisons. French and Dutch monolinguals were tested with paired sets of stimuli, in a task that elicited word boundary misperceptions, i.e., speech material was presented at individual perception threshold. According to the opposite rhythmic markers of word boundaries for French (which is "trailer-timed") and Dutch (which is "leader-timed"), French listeners made more word boundary deletions for iambic (final stress) than for trochaic (initial stress) sequences, while Dutch listeners made the opposite pattern of deletion errors. The influence of segmentation cues used in bilingual's dominant language (French in this study) on speech segmentation of their non-dominant language (Dutch) was also explored. Both native and belated bilinguals behaved in French as the French monolinguals, but made in Dutch more word boundary deletions for iambic sequences and less word boundary deletions for trochaic sequences than did the Dutch monolinguals. This suggest that bilinguals are influenced by the rhythmic cues of their dominant language for segmenting their non-dominant language, at least in difficult perception conditions.

Vincent Goetry
Régine Kolinsky
Philippe Mousty
José Morais

Laboratoire de Psychologie Expérimentale, Université Libre de Bruxelles, CP 191, 50 avenue F. D. Roosevelt, B-1050 Bruxelles, Belgium

[30] High-level processes in language production: The verbal diagnosis of knowledge.

Joachim Grabowski

From a cognitive perspective, the oral and written mode of knowledge diagnosis differ considerably regarding their cognitive loads on working memory, which influences the content validity of the diagnosic measure. A theoretical analysis of the involved resource-consuming subprocesses shows that the verbalization of knowledge should be considerably facilitated in writing as opposed to speaking. This "writing superiority effect" was proved in a series of four experiments described subsequently. N students were to recall all European states and their capitals in one of four conditions with increasing cognitive load: writing, writing with invisible ink, dictating, speaking. They were controlled for their potentially available knowledge on this topic by a cued-recall test. It turned out that both writing groups performed significantly better than both speaking groups. A literal replication with a different sample of N_q confirmed this result. Third, when knowledge about members of a category was experimentally induced, the results were again confirmed. Fourth, the additional variation of self-attention showed, that this situational factor contributes to the causes of greater diagnostic underachievement in oral language production. Altogether, the time course of language production and the management of context information appear as the decisive factors impairing the oral mode of diagnosis.

Chair for Psychology III, University of Mannheim, Schloss EO, D-68131 Mannheim, Germany

[31] Understanding microworlds.

Interdependency (two-way causal processes) is a feature of the natural world. Yet we understand little about the extent to which individuals appreciate interdependence and use it to guide decisions and explanations. When individuals are required to rate the eventual impact of a change in climate (for example) on the size of the plant, herbivore and carnivore populations in a complex microworld, their ratings show a systematic decline with distance from the point of change—a "dissipation effect" (White, 1997) consistent with one-way causal reasoning. As expected, Experiments 1, 2, & 3 of the present paper show that the dissipation effect varies as a function of the complexity of the microworld and the precise task individuals are required to perform. Indeed the effect is abolished when individuals envisage actual numbers (Experiment 3). Experiment 4 required individuals to account for a pattern of population change—here the modal account did involve two-way causal reasoning. It is concluded that individuals can reason qualitatively in terms of two-way causal processes but task constraints and problem framing determine whether or not they do so.

David W. Green

Department of Psychology, University College London, Gower Street, London WC1E 6BT, United Kingdom

[32] Recall of text information in two languages by bilinguals.

Sami Gulgoz
M. Emrah Aktunc
T. Terry Eskenazi

This study aimed to investigate the representation of text in bilingual readers' memory. The participants were 72 native speakers of Turkish studying at a university where the medium of instruction is English. Readers were given either the Turkish or the English version of the text. The original text was in English and it was published in a commercial magazine. The Turkish translation was published in a similar Turkish magazine. The texts were modified slightly to assure equality. Four days later, they were asked to recall the text in the language that they had read the text. Two days after that, they were asked to recall in the other language. Recall protocols were taken again the following week two days apart, first in the language that they had read the text and then in the other language. The participants' skill levels in each language had been measured by standardized tests and they were secured from the student records. The results revealed a disadvantage for writing in English, an effect of repeated recall that reminded hypermnesia, and reduced performance in cross-language recall. The results are discussed in the contexts of bilingual memory and text processing.

Koç University, Cayir cad. No. 5, Istinye TR-80860 Istanbul, Turkey

[33] Repetition and alternation between mental transformations.

Chains of simple tasks were investigated. Each simple task required performing a cue triggered mental transformation (rotation, reflection) on an image. In interpreting a cue subjects establish a cognitive context for executing the mental procedure. Under this assumption influence of the first of two transformations on the second in dependence on the relationship between them is expected. It would be adaptive in alternation of procedures that activating a procedure will lead to deactivation of the current selected procedure. In two experiments with different cue sets it was shown that response times are faster on the second of two successive tasks when transformations are repeated, even though cues, operands, and results did not repeat. Furthermore a category effect was shown: alternations within same category are faster than alternations between different transformation categories. Third order sequences revealed a suppression effect, but this could not be replicated. To check the effect of alternation and repetition we considered also priming of transformations. It was shown that disengagement is one important component in the process of alternation because cost resulting from invalid primes depended on the categorical relationship between primed and executed transformations. The outcomes of experiments support the view that mental procedures can be prepared without processing of operands.

Herbert Hagendorf
Rico Fischer
Jens Grattenthaler
Sabine Voigt

Department of Psychology, Humboldt University, Oranienburger Straße 18, D-10178 Berlin, Germany

[34] How categories influence causal learning.

York Hagmayer
Michael R. Waldmann

The standard approach guiding research on the relationship between categories and causality views categories as reflecting causal relations in the world. We provide evidence that the opposite direction also holds: Categories that have been acquired in previous learning contexts may influence subsequent causal learning. In several experiments we showed that identical causal learning experiences yielded different attributions of causal capacity depending on the pre-existing categories that the learning exemplars were assigned to. There is a strong tendency to continue to use old conceptual schemes rather than switch to new ones even when the old categories are not optimal for predicting the new effect. This effect is particularly strong when there is a plausible semantic link between the categories and the new causal hypothesis under investigation.

Department of Psychology, University of Göttingen, Gosslerstraße 14, D-37073 Göttingen, Germany

[35] Morphophonological influence on the construction of subject-verb agreement.

Modular theories of sentence production assume that there is no feedback from phonological encoding to grammatical encoding. This implies that the construction of subject-verb agreement should be independent of the way grammatical information is phonologically realized. We tested this hypothesis in three experiments that elicited subject-verb agreement errors, using a sentence fragment repetition and completion task. The sentence fragments were noun phrases such as "der hinweis in den akten"(the suggestion in the documents), containing a subject noun (hinweis) and a local noun (akten). In one experiment, in Dutch, we manipulated the determiner of the subject noun. The determiner was either "het" (unambiguously marked for singular) or "de" (ambiguous for number). Sentence fragments of the latter type elicited more agreement errors than sentence fragments with "het"-words. This effect was replicated in an experiment in German, with subject nouns that take "die" (number-ambiguous) and nouns that take "der" or "das" (number-unambiguous). Ambiguity of case-marking in the noun phrase also affected agreement: Attraction effects were larger when case marking of the local noun was ambiguous between nominative and accusative. The implications of these results for theories of sentence production will be discussed.

Robert Hartsuiker
Herbert Schriefers
Kathryn Bock
Gerdien Kikstra

NICI, University of Nijmegen, P.O. Box 9104, NL-6500 HE Nijmegen, The Netherlands

[36] Phonological and visual factors in the visual word recognition.

Jelena Havelka
Clive Frankish

Four experiments examined the effect of articulatory suppression (AS) and case mixing (CM) on visual word recognition using the lexical decision task. In the control condition of the first experiment, response latency increased with increasing word length. Under suppression, response times increased for short but not for long words, while the adverse effect of CM increased with word length. The second experiment examined response latencies for short words with either consistent or inconsistent grapheme-phoneme correspondences. Inconsistent words were significantly more affected by AS than consistent words. In the third experiment CM affected response times more when it led to visual disruption of a functional spelling unit as well as the overall word shape (e.g., pLeAd) compared with the situation when it disrupted overall word shape only (e.g., plEAd). The fourth experiment replicated this finding with words where the critical functional spelling unit corresponded either to the vowel sound (e.g., bOaST vs. bOAst) or to the consonant sound (e.g., sNaCK vs. sNAcK). The implications for theories of visual word recognition are discussed, as well as the possible role of phonology and short-term memory in the reading process.

Department of Experimental Psychology, University of Bristol, 8 Woodland Road, Bristol BS8 1TN, United Kingdom

[37] The elusive collaboration effect: What about memories of action events?

Experiments exploring possible collaboration effects in memory have tended to result in negative findings. If any difference is observed, memory rather is less when recollectors cooperate compared to when they are tested alone. The memory tasks used in these experiments have been standard lists containing unconnected items. Would the results have been different if the collaborators on the memory tests also had been collaborators during encoding of the task materials to be tested for recall later? This study reports a series of experiments where the subjects performed simple actions together, with specified actor roles during encoding. The experiments showed various collaboration effects, some dependent on the ascribed actor role. The results are discussed in terms of the collaboration issue and in terms of theories of action memory.

Tore Helstrup

Department of Psychology, University of Oslo, Box 1094, Blindern, N-0317 Oslo 3, Norway

[38] The role of imageability in word naming: An individual differences analysis.

Chris M. Herdman
Eamon P. Strain

Theorists have proposed a variety of models describing how readers translate printed words into sound. These models differ in many important respects, including whether there are single (e.g., Seidenberg & McClelland, 1989) or multiple routes (e.g., Coltheart, Curtis, Atkins, & Haller, 1993; Norris, 1994) from orthography to phonology and whether semantics can be accessed directly from orthography or must be accessed via phonology (e.g., Van Orden, 1987). Despite these fundamental processing and architectural differences, most theorists assume that semantic information can influence phonological coding. It is surprising, therefore, that there has been very little research directly examining the role of semantics in phonological coding. In the present experiments, we extend research by Strain, Patterson, and Seidenberg (1995) who found that imageability affected naming of low-frequency irregular words. In Experiment 1, we show that the impact of imageability is greater in low- than in high-skill readers. In Experiment 2, the effect of imageability on naming low-frequency irregular words is shown to occur across an extended set of items. Together, our findings show that semantics plays a role in phonological coding when the connections between orthography and phonology are weak.

Department of Psychology, Centre for Applied Cognitive Research, Carleton University, Ottawa, Ontario K1S 5B6, Canada

[39] Semantic activation without conscious identification in visual masking: A re-reapraisal.

We discuss the data accumulated during the last fifteen years concerning the possibility of obtaining semantic priming from masked unconscious primes and Stroop and Stroop-like effects with masked unconscious presentations of the irrelevant aspects of the stimulus. As before, the empirical evidence in favor of unconscious semantic activation is mixed. The extent to which the overall evidence is judged conclusive is more a matter of the taste of the researchers involved in the debate than of a genuine theoretical integration of the different aspects of the problem. A full discussion of the problem involves at least an assessment of how plausible the phenomenon is in terms of: (a) current general theories of information processing, (b) current theories of the tasks involved, (c) current theories of visual perception under masking, (d) current options about the best possible operational definition of awareness, and (e) current availability of alternative interpretations of putative positive effects. In addition to discussing all these aspects of the problem, we will also present new data about Point (e) in the context of the study of unconscious Stroop-like effects.

Daniel Holender

Katia Duscherer

Laboratoire de Psychologie Expérimentale, Université Libre de Bruxelles, CP 191, 50 avenue F. D. Roosevelt, B-1050 Brussels, Belgium

[40] Functional 'tunnel vision' in pattern classification learning.

Martin Jüttner
Ingo Rentschler

Visual pattern recognition has been defined, in cognitive science, as the ability to relate a perceived object to a learned categorical concept. In contrast, physiology and clinical practice often prefer a low-level functional approach, where visual performance is characterized in terms of acuity, visual field and contrast sensitivity. From a paradigmatic viewpoint, the former definition can be related to tasks of pattern classification, whereas the latter involves tasks of discrimination. We show that this dichotomy concerning perceptual tasks corresponds to dichotomous internal representations that observers develop in such tasks. For a common set of grey-level patterns, we compared performance in classification and discrimination learning in both foveal and extrafoveal vision. Performance was evaluated in terms of learning speed and in terms a probabilistic prototype classification model, in order to access the internal representations developed during learning. Learning speed for classification learning was found to be drastically reduced in extrafoveal relative to foveal vision. Discrimination learning of the same signals remained unaffected by viewing condition. Furthermore, internal representations acquired in extrafoveal classification learning are characterized by a distinct reduced perceptual dimensionality. The results suggest that internal representations underlying pattern classification and discrimination arise at distinct cortical levels, and that the former are developed within an extremely narrow visual field essentially restricted to the fovea.

Institut für Medizinische Psychologie, Universität München, Goethestraße 31, D-80336 München, Germany

[41] The influence of anomalous data on solving human abductive tasks.

The integration of anomalous data in existing theories or explanations is an essential part of everyday problem solving, trouble shooting or scientific discovery. In this talk we focus on the integration of anomalous evidence into an existing multicausal explanation and on abductive inference. Abduction refers to an inference to the best explanation by which from a given rule and a given observation a hypothetical explanation has to be inferred (Johsephson & Josephson, 1994). Multicausal explanations are therefore composed of multiple single hypotheses that together explain a set of observations. An anomaly occurs in this context if a new observation contradicts the existing explanation. We will also present an abductive process model of anomalous data integration that makes use of the entrenchment of the current explanation (amount of data explained) and the probability of alternative hypotheses. It is hypothesised that increasing confirmation of the anomaly itself increases the probability of alternative explanations. In an experimental study (N=48) in context of the process model we found that both the entrenchment of an existing explanation and confirmation of the anomaly itself clearly influence how well people resolve anomalous data. These results are in agreement with the predictions of the model.

Andreas Keinath

Josef F. Krems

Department of Psychology, University of Technology Chemnitz, D-09107 Chemnitz, Germany

[42] The role of structural complexity in visuo-spatial working memory.

Eva Kemps

The concept complexity can be subdivided into a quantitative and a structural factor. The former sets an upper bound on complexity; the latter reduces complexity. The present study further investigated the role of structural complexity in visuo-spatial working memory. Two experiments were conducted using a variant of the Corsi blocks task. Complexity was manipulated through the path of the to-be-remembered span. Experiment 1 compared the short-term retention of redundant and complex span paths. The redundant span paths were constructed according to three Gestalt principles of figural goodness: symmetry, continuation and repetition. Performance was better for span paths which constituted redundancy than for complex paths. Experiment 2 explored whether this facilitating effect of redundant span paths on visuo-spatial memory span may reflect the use of long-term knowledge. Subjects were trained in the recall of complex span paths, giving rise to a clear improvement in performance. These results are interpreted within a working memory framework in which visuo-spatial input enters the visuo-spatial sketch pad via activated long-term memory representations.

Department of Experimental Psychology, University of Gent, Henri Dunantlaan 2, B-9000 Gent, Belgium

[43] Attention allocation in reading: Sequential or parallel?

This paper will describe two experiments investigating the degree to which properties of a word presented in the parafovea influence the time to process a word undergoing concurrent foveal inspection. In the first, subjects looked at a set of five-letter words from a fixed fixation point, with words in parafoveal vision varying in length, word frequency, and both the type and token frequency of occurrence of their initial three letters. The results showed that the length, word frequency and initial trigram type frequency of a parafoveal target all influence foveal fixation time. In the second experiment, subjects executed a sequence of saccades before initial fixation on the experimental items. In this more naturalistic task fixation time was shorter overall. Lexical properties of parafoveal words had no effect on foveal processing, but the length and initial trigram type frequency exerted a strong influence on foveal fixation time. Parafoveal-on-foveal effects of this form are incompatible with models of reading in which attention is allocated sequentially to successive words. The data are more consistent with the proposition that foveal and parafoveal processing occurs in parallel, with processing distributed over a region larger than a single word.

Alan Kennedy

Department of Psychology, University of Dundee, Dundee DD1 4HN Tayside, United Kingdom

[44] The role of eye movements in judged displacement of a moving target.

Dirk Kerzel

When subjects are asked to judge the final position of a target traveling along a linear trajectory, they are more likely to indicate a final location that is slightly beyond the target's true position. The memory shift is thought to reflect the internalization of certain aspects of the behavior of objects in the world. In the case of linear motion, objects accrue momentum and cannot be suddenly stopped which results in a forward shift. In this series of experiments we examined the role of eye movements in memory displacement. To this end, we presented targets moving on linear trajectories. At a random position, the target vanished and a probe stimulus appeared either slightly beyond or behind the target's vanishing point. We found that detection performance was superior when the probe appeared beyond the vanishing point indicating that the final focus of attention or the final eye position was shifted in that direction. The tendency of attentional or eye movements to end slightly beyond the true vanishing point was modulated by knowledge of the future path and the velocity of the target. Altogether, the results indicate that the shift in remembered position may reflect the inertia of intentionally controlled movement.

Max Planck Institute for Psychological Research, Leopoldstraße 24, D-80802 München, Germany

[45] New association priming effect in the lexical decision task: Conceptual or perceptual?

Goshen-Gottstein and Moscovitch (1995, Journal of Experimental Psychology: Learning, Memory and Cognition, 21, 1249-1262) presented data indicating that the new association priming effect in the lexical decision task is perceptually based. We report data indicating that this effect may be either perceptually-based or conceptually-based, depending on the nature of the lexical decision stimuli. Further, the new association priming effect is abolished by dividing attention at test when it is conceptually-based, but not when it is perceptually-based. We suggest that the conceptually-based new association priming effect reflects a consciously aware form of memory whereas the perceptually-based effect reflects implicit repetition priming.

Sachiko Kinoshita
Stephanie Knox

Department of Psychology, Macquarie University, Sydney NSW, Australia 2109

[46] Generalization of cognitive switching operations.

Thomas Kleinsorge
Herbert Heuer
Volker Schmidtke

Growing evidence indicates that a shift of task-set is accompanied by a facilitation of response alternations. Recently, we interpreted these observations as indications of a generalizing switching mechanism and provided evidence that such generalizations can occur on other levels of task representation than the response level as well (Kleinsorge & Heuer, 1999). Specifically, when participants have to shift between four tasks that result from a factorial combination of the task dimensions judgment (numerical vs. spatial) and judgment-to-response mapping (compatible vs. incompatible), a shift of judgment seems to generalize upon the level of judgment-to-response mapping, and a shift of any of the task features generalizes upon the response level. We provide evidence from a precueing experiment that these generalizing switching operations are an endogeneously controlled process in that with sufficient preparation the pattern of shift costs that indicates generalized switching 'shifts' into the pattern of precueing benefits.

Institut für Arbeitsphysiologie, Universität Dortmund, Ardeystraße 67, D-44139 Dortmund, Germany

[47] Anticipation of forthcoming strokes is more accurate for self-generated trajectories.

Günther Knoblich
Eva Seigerschmidt
Wolfgang Prinz

In earlier research we have shown that the spatial and temporal characteristics (i.e., the kinematics) inherent in action effects provide cues that allow one to distinguish between self- and other-generated actions. In our view the recognition of self-generated actions is possible because perceiving actions, much like planning actions, involves the anticipation of forthcoming events. One implication of this hypothesis is that the anticipation of forthcoming events should be more accurate when observing self-generated events. We tested this hypothesis in three experiments using a paradigm developped by Orliaguet, Kandel & Boe (1997). Subjects observed kinematic displays of self- and other-generated writing that had been collected one week earlier. These displays reproduced either the first letter of a two-letter string or the first stroke carried out to write a symbol. The subjects' task was to predict either the forthcoming letter or the forthcoming stroke, respectively. The results show that (1) letter prediction is close to chance level, (2) stroke prediction is more accurate, and (3) stroke prediction is even more accurate for self-generated trajectories.

Max Planck Institute for Psychological Research, Leopoldstraße 24, D-80802 Munich, Germany

[48] Response preparation in sequence learning: Effects of stimulus-response compatibility.

Iring Koch

In serial reaction time tasks, at least two mechanisms can underlie sequence learning. Learning can either be based on the stimulus sequence, so that the spatial positions of the next stimuli can be anticipated, or on the sequence of response keys to be pressed, so that responses can be prepared in advance. To address the potential role of response preparation processes for sequence learning, two experiments were conducted. The experiments investigated the question of whether reduced stimulus-response compatibility renders response preparation more effective so that sequence-specific learning is enhanced. In Experiment 1, compatibility was varied in two ways. First, the high spatial compatibility was removed from the task by replacing the spatial stimuli by the letters A to D. Second, stimulus-response mapping was varied. The results indicate more sequence-specific learning for each of the three conditions with reduced compatibility than for the highly compatible condition. This finding was replicated in a second experiment, in which the response-stimulus interval was reduced from 500 ms to 50 ms and only spatial stimuli were used. Taken together, the data are consistent with the hypothesis that sequence learning is at least partly mediated by response preparation processes that allow to 'short-cut' response selection.

Max Planck Institut für Psychologische Forschung, Leopoldstraße 24, D-80802 München, Germany

[49] Impaired recall of words related to demands of a problem solved prior to encoding.

Marek Kowalczyk

In my former experiment subjects solved a simple divergent problem, then performed an ostensibly unrelated speeded classification task concerning each of a series of nouns, and finally free-recalled the nouns. Some of the words corresponded to certain demands of the problem. It was found that recall of these words was impaired relative to control words/conditions. Four experiments were carried out to further investigate the phenomenon. In Experiment 1 a word stem completion task replaced classification and surprise recall tasks, in Experiment 2 encoding of words preceded solving the problem. Neither relative frequencies of problem related completions in Experiment 1, nor recall scores for problem related words in Experiment 2 showed any efect of problem solving on performace. Experiment 3 replicated the finding of impaired recall with another classification task following problem solving. The effect was much stronger in male than in female subjects, furthermore, females showed impaired recall of words that immediately followed problem related words in the classification task. The results suggest that impaired recall of problem related words is due to inhibitory defence against task-irrelevant processing they cause in the classification task, and impaired recall of neighbouring words results from lack of inhibition or its inefficiency. Experiment 4 examines the magnitude of both effects at different interstimulus intervals in the classification task. The analysis of the data hasn't been finished yet.

Institute of Psychology, Adam Mickiewicz University, Szamarzewskiego 89, PL-60-568 Poznan, Poland

[50] Response preparation includes the anticipation of response effects.

Wilfried Kunde
Joachim Hoffmann
Philipp Zellmann

Human behavior is usually not stimulus-driven and reflexive but goal-oriented and intentional. Successful goal-oriented behavior requires behavioral acts to be selected by means of an anticipation of their reliable outcomes. From this view it is plausible to assume that the preparation of an action includes an anticipation of its sensory effects (James, 1891). We tested this assumption in a series of response-preparation experiments: Subjects had to prepare a certain action (keypress) with a fixed sensory effect (e.g., a tone of a certain pitch). Either before or instead of carrying out the prepared action, another response had to be executed that either resulted in the same or a different effect (tone of same or different pitch). We investigated how fast the response could be initiated as a function of the correspondence between the effects of the response and the already prepared action. The results show that in general the response is faster initiated if it leads to the same rather than a different effect as the concurrently prepared action. We regard this result as evidence for the notion that the preparation and execution even of very simple actions are controlled by an anticipation of their sensory effects.

Psychologisches Institut III, University of Würzburg, Röntgenring 11, D-97070 Würzburg, Germany

[51] Is print-to-sound conversion based on rules?

In most alphabetic systems the mapping between spelling and sound is quasi systematic. Many graphemes have multiple pronunciations, among which one is considered as regular. One claim of most dual-route models of reading compared to connectionist models is that the knowledge of print-to-sound correspondences is restricted to rules encoding the most frequent phonemic mapping of each orthographic unit. This assumption was tested in two experiments. In the first experiment, a replication and extension of Ziegler & Jacobs (1995) letter detection experiments, we examined whether the soft and hard pronunciation of G and C are activated. We compared performance on letter-absent pseudohomophones (J in GEUDI) and control pseudowords (J in BEUDI) with letter-absent "false pseudohomophones" (J in BONGOUR) and their respective controls. Longer detection times were observed for G items compared to their orthographic controls for both real pseudohomophones and false pseudohomophones, suggesting that the contextually appropriate and inappropriate pronunciations are activated. In a second experiment, we examined naming latencies for pseudowords varying in grapheme frequency and grapheme entropy (an uncertainty measure capturing the degree of predictibility of grapheme-phoneme correspondences). A significant effect of both variables was found, demonstrating the graded nature of the representations in the print-to-sound conversion system.

Mareille Lange
Alain Content

Laboratoire de Psychologie Expérimentale, Université Libre de Bruxelles, Avenue F. D. Roosevelt, 50 - CP 191, B-1050 Brussels, Belgium

[52] You must see the point: Automatic processing of cues to the direction of social attention.

Stephen R. H. Langton

Vicki Bruce

Four experiments are reported that explore the processing of pointing gestures comprising hand, head and gaze cues to direction. The cross-modal interference effect exerted by pointing hand gestures on the processing of spoken directional words, first noted by Langton et al. (1996, JEP:HPP), was found to be moderated by the orientation of the gesturer's head/gaze (Experiment 1). Hand and head cues also produced bi-directional interference effects in a within-modality version of the task (Experiment 2). These findings suggest that both head/gaze and hand cues to direction are processed automatically and in parallel up to a stage in processing where a directional decision is computed. In support of this model, head/gaze cues produced no influence on non-directional decisions to social emblematic gestures in Experiment 3, but exerted significant interference effects on directional responses to arrows in Experiment 4. It is suggested that the automatic analysis of head, gaze and pointing gestures occurs because these directional signals are processed as cues to the direction of another individual's social attention.

Department of Psychology, University of Stirling, Stirling FK9 4LA, United Kingdom

[53] Brain activation during mental transformation of size.

Axel Larsen
Claus Bundesen
Søren Kyllingsbæk
Ian Law

Visual comparison between different-sized objects with respect to shape can be done by encoding one of the objects as a mental image, transforming the image to the size format of the other object, and then testing for a match. To identify the brain structures implicated in mental transformation of size, we measured regional cerebral blood flow by positron emission tomography (PET) while subjects compared random stimuli with respect to shape regardless of variations in size in a one-back match-to-sample paradigm. Subjects were PET scanned in two baseline conditions, in which all stimulus patterns were either small or large. In a third experimental condition, the stimuli alternated between small and large. Mental transformation of size should occur in the alternating-size condition but not in the fixed-size conditions. As expected, behavioral measures (RT, d', beta) were nearly the same for the two fixed-size conditions but mean RT was longer and d' smaller in the alternating-size condition. By statistical parametric mapping (SPM96), the detected brain structures implicated in mental transformation of size were primarily located in the dorsal pathways, comprising structures in the occipital, parietal, and temporal transition zone (predominantly in the left hemisphere), posterior parietal cortex (bilaterally), area MT/V5 (left), and vermis (bilaterally).

Department of Psychology, University of Copenhagen, Njalsgade 88, DK-2300 S, Denmark

[54] Orthographic vs. morphemic factors in inhibitory priming during word recognition.

Alessandro Laudanna
Alfonso Caramazza

Three lexical decision experiments were carried out in order to address the issue of the respective roles played by orthographic similarity and morphological relatedness during the recognition of morphologically complex words. In our experiments, we compared the effect on target words like voluto "wanted" when primed by a stem homograph like volava with the effect obtained on the same target (voluto) when primed by orthographically similar words of two types: words beginning with an orthographic sequence which was the same as the target's stem (e.g., volume "volume (N, masc., sing.)" whose stem is volum-) and words which did not share the whole initial part of the string (e.g., valute "monetary values (N, fem., plur.)" whose stem is valut-). In the two experiments, we also evaluated the role of prime/target respective frequencies: in one half of the stimuli prime frequency was higher than target frequency, in the other half the frequency relationship was reversed. In both the experiments we found a consistent inhibitory effect on homographic stems, in absence of any interaction with frequency: high frequency stems inhibited low frequency homographic stems as effectively as low frequency stems inhibited high frequency stem homographs. We also found an inhibitory effect on targets which were preceded by orthographically similar primes beginning with the same orthographic sequence as the target's stem. However, this effect strongly interacted with word frequency: it was found only when targets were preceded by primes of higher frequency. The pattern of results provides support for the hypothesis that the inhibitory effects found on stem homographs and purely orthographically similar word, respectively, are determined by different mechanisms.

Istituto di Psycologia, CNR, Viale Marx 15, I-00137 Roma, Italy

[55] Looking at you! The role of relational features in face perception.

Helmut Leder

Configural features are known to play an important role in face perception. Moreover, deficits in processing configural aspects have been discussed as possible causes for the face inversion effect. In the talk, different candidates for what configural information might be, are discussed and empirical studies are presented in which it was investigated (a) whether configural information is explicitly recognised (b) whether holistic or rather local definitions of 'facial configuration' are empirically distinguishable (Leder & Bruce, submitted) and (c) whether the processing of configural features is sensitive to orientation (Leder, Candrian, Huber & Bruce, submitted).

Department of Psychology, Free University Berlin, Habelschwerdter Allee 45, D-14195 Berlin, Germany

[56] Selective effects of language context on word processing in bilinguals.

Kristin Lemhöfer
Ralph Radach

The influence of language context or 'language mode' is a central issue in current discussions on word processing in bilinguals. Subjects performed a lexical decision task in separate sessions within a German, English and bilingual language context created using monolingual vs. mixed language test exercises prior to the main experiment. Rejection time for pseudowords served as an indicator of context-induced processing selectivity, as this measure is known to vary with word similarity. High and low frequency words were matched for length, morphology and positional bigram frequency. Pseudowords were more similar to either German or English words, avoiding language-specific orthographic cues. Similarity was defined in terms of the number and frequency of word neighbors in both languages, and confirmed in plausibility ratings. Response times for words were found to be increased in the bilingual condition. This replicates results of Grainger & Bauvillain (1987), who attributed a similar finding to immediate effects of changing from one language to another within a mixed stimulus list. In our study the effect remained significant when this factor was controlled. Identical pseudowords were rejected more slowly when presented in the more similar language context. This indicates context-induced selectivity, not only for legal vs. illegal nonwords (Altenberg & Cairns, 1983), but also with respect to legal pseudowords whose language similarity is exclusively based on neighborhood frequency measures. Implications of these results will be discussed.

Institute of Psychology, Technical University of Aachen, Jägerstraße 17, D-52064 Aachen, Germany

[57] Classical conditioning as a basis for human timing processes.

Sander Los

The importance of human timing processes can be readily demonstrated in warned reaction tasks. In these tasks the participant receives a warning stimulus (WS) followed by an imperative stimulus (IS) which requires a speeded simple or choice response. The interval between WS and IS is commonly known as the foreperiod. It has been known since Woodrow (1914) that both the duration of the foreperiod and its intertrial variability, has an important effect on speed of responding to IS. These effects have been taken as evidence for a preparatory process, whose fluctuations in time are determined in a controlled way by a separate timing mechanism. Recent work in our laboratory suggests, however, that the preparatory process and timing mechanism are parts of a single system, which is governed by the principles of classical (trace) conditioning. In this presentation I would like to discuss some new evidence for this position.

Department of Psychonomics, Vrije Universiteit Amsterdam, De Boelelaan 1111, NL-1081 HV Amsterdam, The Netherlands

[58] Disengaging of attention and inhibition of return.

Juan Lupiáñez
Maria Ruz

When attention is captured at a specific location by an exogenous spatial cue, processing of information at this location is facilitated. Some time after attention is captured processing of information is impaired leading to the effect known as Inhibition of Return. This effect has been observed in different detection, localisation and discrimination tasks. However, according to Lupiáñez et al. (1997) in order to observe IOR in discrimination tasks a longer cue-to-target SOA is needed. In this research we explored the hypothesis that, if we have to perform a discrimination task, once attention is captured at a location it takes longer to be disengaged, and therefore IOR appears later. Across several experiments we observed a similar time-course of IOR in discrimination and detection tasks, when attention was disengaged from the cued location, either exogenously or endogenously, before the target appeared. Results are discussed within a new framework of IOR in which exogenous attention is automatically triggered but endogenously modulated.

Departamento de Psicología Experimental, Facultad de Psicología, Universidad de Granada, Campus de Cartuja, S/N, E-18071 Granada, Spain

[59] Does feedback consistency explain polysemy and homophone effects in visual word recognition?

In a lexical decision task (LDT), Hino and Lupker (1996) reported a polysemy effect (faster response times for polysemous words [e.g., BANK] than for non-polysemous words), and attributed this effect to consistent feedback from the semantic system to orthographic units for polysemous words. Pexman, Lupker, and Jared (in review) reported a homophone effect in LDT (slower response times for homophonic words [e.g., MAID] than for non-homophonic control words) and attributed this effect to inconsistent feedback from the phonological system to orthographic units for homophones. In the present research we tested two sets of predictions derived from this feedback consistency explanation, that would not be made by other explanations of these effects: (1) homophone effects should be observed in LDT even when other phonological effects (e.g., regularity, homography) are not observed and the homophone effect will be larger with pseudohomophones (e.g., BRANE) as foils, while the other phonological effects will not be larger; and (2) polysemy and homophone effects should co-occur in LDT; and should both be larger with pseudohomophones as foils. The results supported all predictions and suggest that feedback consistency is the source of both polysemy and homophone effects.

Stephen J. Lupker
Penny M. Pexman

Department of Psychology, University of Western Ontario, London, Ontario N6A 5C2, Canada

[60] The picture bizarreness effect: An example of distinctiveness in exPLICIT AND imPLICIT MEMORY.

Anne Marchal
Serge Nicolas

Several experiments aimed at investigating the distinctiveness effect of bizarre imagery in explicit and implicit memory. Experiment 1 was conducted to show a picture bizarreness effect with drawings and an explicit memory test. Two variables were manipulated: First, drawings were presented either alone or with their verbal label; second, study instructions invited subjects either to memorize a mixed list of common and bizarre drawings or to rate the bizarreness of drawings. In all conditions, subjects performed a free recall test. Results show a picture bizarreness effect in all conditions. Experiment 2 compared an explicit category cued recall test and an implicit category association test. The picture bizarreness effect was observed only with the explicit test, indicating that intentional retrieval is necessary for this effect to appear. Experiment 3 used a free recall test but lists were predominantly composed of bizarre drawings or common drawings. The picture bizarreness effect was strong in the predominantly common lists but it disappeared in the predominantly bizarre lists. Experiment 4 used the same explicit and implicit tests as in Experiment 2 and the same list structure manipulations as in Experiment 3. We hypothesized that the picture bizarreness effect will be observed with the predominantly common list only with the explicit test but not with the implicit test. The analysis of data is currently in progress.

Laboratoire de Psychologie Expérimentale, Université René Descartes et E.P.H.E, CNRS UMR 8581, Paris, France

[61] Category, features, modality and the living things dissociation in semantic memory.

J. Frederico Marques

The living/nonliving things double dissociation is a well-established phenomenon in neuropsychology for which different explanations have been proposed in terms of the organization of semantic memory. The first part of this presentation reviews these different explanations and proposes a rationale for their comparison. The second part of this presentation reports a study that compared multiple semantic and unitary view models of semantic organization (Warrington & Shallice; Farah et al.; Caramazza, Hillis et al.; Riddoch & Humphreys) using the Release from Proactive Interference (PI-release) paradigm. The study tested normal subjects with this task using word vs. picture stimuli in a standard taxonomical PI-release condition (i.e., nonliving to living things) and in a cue condition with attributes (functional and perceptual) that run opposite to the taxonomical shift. The overall pattern of results seems more in accordance with Warrington and Shallice's model with some additional considerations. Implications for the proposed rationale and for the other models, including possible alternative accounts of the results, are also presented.

Faculty of Psychology and Education, University of Lisbon, Alameda da Universidade, P-1649-013 Lisboa, Portugal

[62] Temporal order effects in counterfactual and semifactual thinking about what might have been.

Rachel McCloy
Ruth M. J. Byrne

Research on counterfactual "if only" thinking about how things might have been different has shown that people are more likely to focus on the more recent event in an independent temporal sequence of events, rather than on earlier events in their "if only" thoughts. We report the results of two experiments that examined this temporality effect in thinking about what might have been. We examined the temporality effect in counterfactual thinking about what might have been different, compared to semifactual "even if" thinking about how things might have turned out the same. The experimental results show that when people alter some aspect of the sequence of events to complete an 'if only' or 'even if' thought, the temporality effect occurs in counterfactual thinking but it does not occur in semifactual thinking: people focus on more recent events when they think 'if only' but they focus equally on earlier and more recent events when they think 'even if'. When people make judgements about the guilt or blame experienced by the protagonists in the scenario, the temporality effect occurs for both counterfactual and semifactual thinking: people judge that the second player will feel more guilt and be blamed more than the first player. We suggest that the differences between counterfactual "if only" and semifactual "even if" thinking result from the mental representations that people construct when they think about how things might have been different or might have turned out the same.

Department of Psychology, University of Dublin, Trinity College, Dublin 2, Ireland

[63] Do poor readers suffer a specific deficit in anaphor processing? On-line studies of listening comprehension.

The purpose of the present studies was to investigate listening comprehension in 7-year old good and poor readers, and especially the on-line processing of anaphors. Two hypotheses were tested: the developmental lag hypothesis views poor readers as suffering specific problems in anaphor resolution, whereas the processing limitation hypothesis maintains that poor readers suffer a more general deficit. In the first experiment, children were submitted to a mispronunciation detection task (Tyler, 1983). Children listened to short texts. Four types of anaphors began the second sentence: Repeated Noun phrase, General Noun, Unambiguous Pronoun and Control item. Phonological errors were placed on the word in object position. The main result showed no interaction between reading comprehension ability and types of anaphors. The second experiment used a cross-modal naming task (Marslen-Wilson, Tyler & Koster, 1993). Children heard short texts. The second sentence began with a subject anaphor which was a Repeated Noun phrase or a Pronoun. It ended with an object pronoun presented as a visual probe. Two types of object pronouns were used which were consistent or non consistent with the subject anaphor. The results showed no interaction between reading comprehension ability and types of object pronouns. The results of these two experiments tended to support a general deficit hypothesis, rather than a specific deficit in processing of anaphors. A third experiment is currently in progress in order to investigate integrative processes during the resolution of anaphors. The lexical properties of subject pronouns and the verb bias are manipulated in the cross-modal naming task.

Hakima Megherbi
Marie-France Ehrlich
Catherine Loridant

Laboratoire de Psychologie Expérimentale, Université René Descartes, EPHE and CNRS, 28 Rue Serpente, F-75006 Paris, France

[64] Implicit learning of first and higher order sequential dependencies.

Annemie Melis
Eric Soetens
Wim Notebaert

We investigated the influence of constraints on first-order and higher order sequential dependencies on implicit learning of a repeating patterned stimulus sequence. When a random stimulus sequence is introduced after practice, reaction time (RT) increases, indicating implicit learning of the pattern. In serial RT tasks with a compatible four-stimulus, left-right response mapping, participants practiced stimulus sequences that contained either first-order and higher order sequential dependencies, or only higher order dependencies. The frequencies of stimulus alternatives and transitions up to third-order were balanced for the two sequences. Results show that the amount of implicit learning is reduced for the sequence with no constraints on first-order sequential dependencies. Detailed analyses of practiced and unpracticed sequences occurring in the random sequence blocks, indicate that both first and higher order stimulus transitions contribute to the implicit learning effect. That is, for the sequence with first-order dependencies, the first-order transition knowledge does not transfer from one response hand to the other. Analysis of practiced and unpracticed higher order (stimulus and response) transitions, which is in progress, will clarify the type of knowledge acquired from the sequence with only higher order sequential dependencies.

Cognitive and Physiological Psychology, University of Brussels, Pleinlaan 2, B-1050 Brussels, Belgium

[65] Inflectional morphology in the French mental lexicon.

We used a cross-modal priming paradigm combined with a lexical decision task to investigate the mental representation of regular and irregular verbal forms in French. Subjects heard a spoken prime (such as *aimons*) immediately followed by lexical decision to a visual probe (such as *aimer*). We contrasted four types of French verbs, varying in the phonological and morphological regularity of their verb form inflection. These were (I) totally regular verbs (*aimons*/*aimer*) (ii) verbs that have phonological changes in some cases (*sèment*/*semer*) (iii) verbs on which sub-rules applied (*teingnent*/*teindre*) and (iiii) totally irregular verbs that have idiosyncratic form in some cases (*vont*/*aller*). The infinitive form of these verbs were presented as target in three prime conditions: preceded either by a regular form, an irregular or a modify form (not for the totally regular verbs as it was not possible), or a control prime. Morphological primes (regulars as irregulars) significantly facilitated lexical decision responses for all four verb classes. No interaction was found, which means that the facilitatory effect did not differ whatever the type of prime was and also whatever the type of verb was. These results differed from those observed in English. We interpreted this difference as evidence of the influence of the language structure on the way rules are used in the mental lexicon.

Fanny Meunier

William Marslen-Wilson

Cognitive and Brain Science Unit, Medical Research Council, 15 Chaucer Road, Cambridge CB2 2EF, United Kingdom

[66] Stroop dilution: Evidence for attention capture.

Holger Mitterer
Wido La Heij
A. H. C. van der Heijden

Faculteit der Psychologie, University of Maastricht, Postbus 616, NL-6200 MD Maastricht, The Netherlands

Stroop dilution refers to the observation that the impact of a color word on the naming of a color bar is reduced if another word-like object is displayed simultaneously. Recently, Brown, Roos-Gilbert, and Carr (1995) concluded that Stroop dilution is due to early-visual interference. This conclusion was evaluated in four experiments. Experiment 1 showed that, contrary to the predictions of an early-visual interference account, (a) diluters of similar visual complexity induced different amounts of dilution and (b) the size of the dilution effect is proportional to the size of the Stroop interference effect. Experiment 2 showed that a word-like object does not reduce the Stroop interference when classical Stroop stimuli are used. Moreover, Experiments 3 and 4 revealed that when the position of the color bar is precued, Stroop dilution disappears. We argue that these findings support Van der Heijden's (1992) attention-capture account of Stroop dilution.

[67] Contributions of studies about the frequency effects in the processes of activation and long-term conservation of episodic memory traces.

Brigitte Nevers

Rémy Versace

The aim of our study is to validate the multiple-trace memory model. In such a model, all information processing experiences or episodes, are supposed to result in the activation of multiple traces already encoded in memory and eventually, in the long-term conservation of (new) memory traces. We supposed that the integration of the traces previously activated is an essential condition for the long-term conservation of traces, and that it requires time and awareness to occur, whereas activation is thought to be immediate and automatic. Thus, when information is perceived with a too short processing time, only an activation of elementary properties could occur, but if the conditions allow to integrate the activated properties, long-term conservation could exist. Two experiments observed the frequency effects on repetition priming to account for these processes. The material used (form and color of rectangles) was constructed in order to control the properties that could be activated and to manipulate the "whole-stimulus frequency" (Experiment 1) and the "form feature frequency" (Experiment 2). In a study-phase, subjects learned to classify the rectangles in two categories defined by a combination of the two properties and in a repetition priming phase, subjects had to classify the prime either as they learned during the study-phase or in two categories defined on the form only. Prime duration was 100 or 1000 ms and ISI was 100 or 3000 ms. As expected, a "whole-stimulus frequency effect" on priming was obtained with the longer prime duration only and with a very brief prime duration and a short ISI, a feature frequency effect was observed. Thus, it seems that the "whole-stimulus frequency effect" depends on feature integration.

Département de Psychologie Cognitive, Université Lumière Lyon 2, 5 avenue Pierre Mendes-France, F-69676 Bron Cedex, France

[68] Causal knowledge and language processing.

Leo Noordman

Causality is a fundamental category in human cognition. This paper deals with the role of causality in language understanding. The hypothesis is that linguistic structures that more directly reflect a causal relation are easier to process than other structures. This hypothesis will be tested in reading time experiments. The first experiment deals with the iconicity between chronological order of the cause and the consequence in the text and in the world. Iconicity speeds up processing. The second experiment tests a conceptual correspondence between the sentence and the world. Sentences in which the because clause expresses what is conceptually the cause in the world are compared with sentences in which the because clause expresses what is conceptually the consequence in the world ("John failed the exam because he had not worked hard" vs. "John had not worked hard because he failed the exam"). Conceptual correspondence speeds up sentence understanding. But this result can be accounted for by two factors: the former sentence expresses the causal relation directly (direct causal), the other sentence expresses a reasoning (an epistemic causal); the former sentence deduces the consequence from the cause while the latter sentence deduces the cause from the consequence. In a third and fourth experiment the effects of these two factors are investigated separately. The results will be discussed in terms of principles that deal with the relation between language and knowledge of the world: the iconicity principle, the conceptual principle and the epistemic principle.

Department of Language and Literature, Tilburg University, P.O. Box 90153, NL-5000 LE Tilburg, The Netherlands

[69] Experts reasoning about communication with laymen: Web-experiments.

Research in the cognitive psychology of everyday communication has shown that the ability to take an addressee's perspective is a fundamental prerequisite for listener adapted communication. Successful audience design is even more indispensible when the interlocutors systematically differ with respect to their domain knowledge of the discourse topic. In two web-experiments, we have analysed computer experts audience design in planning explanations for laymen. How is information about the addressee and about the topic itself integrated in the planning process? The internet is at the heart of our approach. It is the topic to be communicated and it provides our experimental method. Internet-experts rated in how much detail they would go into some specific concepts (e.g., hyperlink), when they are asked to explain a layman a topic such as the WWW. In Experiment 1 (N=48) concept importance and the addressee's level of domain knowledge were systematically varied. In Experiment 2 (N=48), the addressee's intention was an additional independent measure. While the addressee's knowledge level had a rather small effect on the judged degree of detail, a strong effect of the addressee's intention was found. It will be discussed why the knowledge level as a pragmatic variable is difficult to consider for experts.

Matthias Nückles

Rainer Bromme

Psychologisches Institut III, University of Münster, Fliednerstraße 2, D-48149 Münster, Germany

[70] Recollection and familiarity in recognition memory for musical themes.

Marta Olivetti Belardinelli

Clelia Rossi-Arnaud

Recognition memory for musical stimuli was tested in untrained novice young adults (19 to 24) and children (7 to 9) in 3 experiments. Subjects listened to a set of novel musical themes for a varying number of listening trials. In later recognition tests these melodies were represented along with a set of similar themes which had not been presented in the study list. Subjects had to identify the themes they had heard earlier in the experiment. Four types of musical stimuli were devised by a composer: 1) salient tonal (ST); 2) non salient tonal (NST); 3) salient non tonal (SNT) and 4) non salient non tonal (NSNT). To test the children only half the stimuli were presented each session; in the first experiment they were grouped according to salience (all salient stimuli on session 1 and all non salient stimuli on session 2) while in the second experiment they were grouped according to tonality. Results showed that: a) additional study trials improved recognition in adults but not in children; b) children were more likely to recognize ST themes than themes belonging to the other categories; c) adults made more "remember" responses on the salient themes than on the nonsalient stimuli.

ECONA and Department of Psychology, University of Rome "La Sapienza", Via dei Marsi, 78, I-00185 Rome, Italy

[71] Effects of divided attention on speech monitoring.

Claudy C. E. Oomen
Albert Postma

Speech monitoring is the process by which speakers check their own speech on correctness and appropriateness. Speakers can interrupt erroneous or inappropriate utterances in order to self-repair. The most widely accepted monitoring theory suggests that monitoring is essentially a perceptual function: speakers detect errors by listening to their own inner and overt speech. Monitoring is a central and attentional activity (Levelt, 1989). The present study examined the effect of divided attention on speech monitoring. As perception monitoring is an attentional function, it can be regarded as a resource limited mechanism, which would be highly affected in a dual task situation. An experimental task was developed, in which subjects described visually presented networks. In the divided attention condition, subjects described networks while at the same time they generated sequences of random finger tapping responses. The results pointed out that in a divided attention situation, a smaller percentage of errors was corrected than in a speech-only situation. In addition, more repetitions (covert repairs) were produced. Divided attention also affected some temporal monitoring characteristics. An effect of speaking on random finger tapping performance was also present. The implications of these findings for perception monitoring will be discussed.

Psychological Laboratory, Utrecht University, Heidelberglaan 2, NL-3584 CS Utrecht, The Netherlands

[72] Working memory and memory for a passage in children who are poor comprehenders.

Paola Palladino
Cesare Cornoldi
Rossana De Beni
Francesca Pazzaglia

With the present research we investigated the hypothesis that a poor working memory performance in children who are less skilled comprehenders can be due to inefficient suppression mechanisms and the hypothesis that inefficient suppression mechanisms, causing overload and high interference in working memory, might influence reading comprehension, too. In reading a passage, a reader processes a great deal of information, more and less relevant to text coherence and consistency. If poor comprehenders are less able to reduce the activation of no longer relevant information, they may have high memory interference that could damage memory of relevant information and probably benefit memory for irrelevant information. Two groups of 8th grade children matched for spatial intelligence who differed specifically in the ability of inferential comprehension were compared on measures of short-term (passive storage) and working memory (contemporary maintenance and processing). Intrusion errors were computed as expressing a measure of the inefficiency of suppression mechanisms. Data are presented showing that this suppression ability may have a causal role and is the best predictor of the score obtained at a reading comprehension test presented one year later. The ability appears also related to prose recall: children who are poor comprehenders not only have a low working memory span and make more intrusion errors, but also remember a proportionally higher number of irrelevant information contained in the text.

Department of General Psychology, University of Padova, via Venezia 8, I-35131 Padova, Italy

[73] The perception of stress by French-Spanish bilinguals.

During the processing of spoken language, words are coded phonologically. This representation is language-specific and limits our capacity to perceive distinct phonological properties of a foreign language, giving rise to "phonological deafnesses". For instance, French subjects, as opposed to Spanish subjects, have difficulties in distinguishing two words that differ only in the location of stress. This is due to the fact that in French, word stress is predictable; French speakers, therefore, do not need to code stress in their phonological representation of lexical items. In Spanish, by contrast, stress is contrastive. Hence, Spanish speakers code stress in their phonological representation of words. We present a series of experiments that uses a novel paradigm that allows the study of phonological deafnesses individual by individual. We demonstrate that based on their performance in our task, we can classify individual monolingual subjects as either French or Spanish with more than 90% accuracy. This allows us to run follow-up experiments with various populations of bilingual French/Spanish subjects, controlled for linguistic background and age of acquisition. The results of these experiments will be presented in our presentation. Finally, we show that our paradigm can be used for testing other kinds of phonological deafnesses in both mono- and bilinguals.

Sharon Peperkamp
Emmanuel Dupoux
Nuria Sebastien

Laboratoire de Sciences Cognitives et Psycholinguistique, EHESS-CNRS, 54 Boulevard Raspail, F-75270 Paris Cedex 6, France

[74] The effects of syllable neighborhood in reading, lexical decision and identification tasks.

Manuel Perea
Manuel Carreiras

Recent research has shown that the syllable is a sublexical unit that mediates access to the words in a shallow language such as Spanish (e.g., "syllable frequency effect" and "syllable neighborhood effect"; see Carreiras et al., 1993; Perea & Carreiras, 1998). The main aim of this study is to shed more light on the effects of a word's syllabic neighbors in normal reading when target words varying in the number of higher frequency syllabic neighbors are embedded in sentences. If syllabic effects are found, then one has clear evidence that syllabic effects are not restricted to laboratory word identification tasks but are actually influencing reading. For comparison purposes, we also collected data from three standard paradigms (lexical decision, progressive demasking and materialization tasks). The results with the reading task showed some "early" facilitative effects of having many higher frequency syllabic neighbors in the first syllable (see Lima & Inhoff, 1984). In addition, performance on the four different tasks was compared. A principal-components factor analysis showed that lexical decision times, identification times, percentage of regressions, and total time were the four highest loaded variables on Factor 1, whereas first fixations and gaze durations were the two highest loaded variables on Factor 2.

Area de Metodologia, Facultad de Psicología, Universidad de Valencia, Avenida Blasco Ibanez, 21, E-46010 Valencia, Spain

[75] Word order and conceptual effects in syntactic priming.

We report three experiments that investigate the effects of syntactic priming on written language production (Pickering & Branigan, 1998, 1999; Branigan et al., in press). Participants completed sentence fragments (e.g., the farmer gave ...) that were compatible with either a "prepositional object" completion (... the straw to the horse) or a "double object" completion (... the horse the straw), immediately after they completed a prime sentence as one of these two sentence types, as a "heavy-shifted" sentence (e.g., the man gave to the boy the very heavy book), or as an intransitive (e.g., the man sneezed very loudly). In accord with earlier work, participants tended to repeat syntactic form. However, heavy shifted sentences did not prime either the prepositional object or the double object form. Instead the relative proportions of the two forms was similar to that of the baseline. This suggests that there is a component of priming that is sensitive to word order. However, the combined proportion of both types of sentences was greater for the heavy shifted than the baseline form, suggesting that there is also a conceptual basis for priming in terms of the number of entities involved in an action.

Martin J. Pickering
Holly P. Branigan

Department of Psychology, University of Glasgow, Florentine House, 53 Hillhead Street, Glasgow G12 8QF, United Kingdom

[76] More than hindsight bias: Systematically distorted recall of the solutions of difficult knowledge questions.

Rüdiger F. Pohl

In hindsight, people tend to overestimate what they had known in foresight. Recollections of earlier given estimates to difficult knowledge questions are typically distorted towards the solutions that where presented prior to recall. This is the well-known hindsight bias. In addition, however, recollections of the solutions are biased, too, namely towards the original estimates. This less well-known finding supports the idea that hindsight bias is not just a consequence of updating one's knowledge base (i.e., learning), but rather a general cognitive mechanism that distorts memory. This paper presents an experiment that measured both types of hindsight bias and found that they were of similar magnitude. The results are discussed within the framework of SARA, a cognitive process model for explaining and simulating distorted judgment and recall.

Psychology, Justus-Liebig-University Giessen, Otto-Behaghel-Straße 10, D-35394 Giessen, Germany

[77] The role of task relevant and irrelevant dimensions in task switching.

The costs associated with switching between two tasks are reduced if the stimuli indicate the corresponding task unambiguously (Jersild, 1928; Spector & Biederman, 1976). We attempted to replicate this finding and investigated the role of further, possibly related factors in task switching performance, such as negative priming and the overlap of stimulus dimensions from trial to trial. In our task, participants had to respond either to the colour or to the form of a series of coloured letters predictably. We assumed that switching between these ambiguous stimuli depends on the repetition respectively the alternation of one or both stimulus features. In particular, we expected that switching is easier if all stimulus features change than if one or all features are repeated. Our results show that there was no evidence for a pure negative priming effect on task shift performance and that switching was indeed easier if all stimulus features changed and worst if all stimulus features were repeated.

Bianca Pösse

Bernhard Hommel

Max Planck Institute For Psychological Research, Leopoldstraße 24, D-80802 München, Germany

[78] On the relation between different measures of spatial memory.

Albert Postma

Spatial memory concerns the ability to remember the spatial layout of our environment. It enables us to learn the route between two locations in our neighbourhood, to know where things are, and know where we are ourselves in relation to relevant landmarks. In the literature several methods have been proposed to assess spatial memory. For example, a rather popular measure of spatial working memory concerns the Corsi Block Tapping Test, in which a subject has to reproduce a pattern of a given length tapped over nine identical wooden blocks. Another test is the Stylus Maze, in which subjects have to learn a route through a small-scale maze. In Postma and de Haan (1996) an object location memory task is featured, which requires relocation of objects presented on a computer screen. It is argued that object location memory entails multiple separable subcomponents (e.g., remembering the precise locations vs. binding objects to locations). A more ecologically valid method to investigate spatial memory involves subjects' route learning behaviour in real life environments. In the present paper, a direct comparison is made of the foregoing tests, in order to further establish the organisation of spatial memory processes and their intricate relations. The present results are part of a larger study on sex differences and hormonal mechanisms in spatial memory.

Psychological Laboratory, Helmholtz Institute, Utrecht University, Heidelberglaan 2, NL-3584 CS Utrecht, The Netherlands

[79] Finite mixture distribution models of simple discrimination learning.

The existence of distinct modes of learning, such as implicit learning and explicit learning, though often posited, is not easy to establish. In the present article we propose using the statistical technique of finite mixture distribution modeling to investigate the existence of different modes of learning a simple discrimination during development. With this methodology, one models distributions of task performance, in our case the number of errors during the first n trials of learning a simple discrimination. The main purpose of the application of this technique is to establish whether multiple learning modes occur during development. The data are obtained in a repeated measurement study in which subjects aged 6 years to 10 years carried out a simple discrimination learning task. In addition to calculating the maximum likelihood estimates of the parameters of one and two-component mixture distribution models, power analysis of the goodness-of-fit tests, Monte Carlo bootstrap of the test statistics, and model selection are performed. The finite mixture distribution analysis of the data provides strong support for the existence of distinct modes of learning behavior. In addition, age related changes, the effect of verbally labeling the relevant stimulus cue, and the consistency of behavior over measurement occasions are related to the mixture model estimates.

Maartje E. J. Raijmakers

Conor Dolan

Peter C. M. Molenaar

Department of Psychology, University of Amsterdam, Roetersstraat 15, NL-1018 WB Amsterdam, The Netherlands

[80] Bilateral field interactions in number processing.

Elie Ratinckx
Marc Brysbaert
Bert Reynvoet

To investigate whether number magnitude is equally present in both cerebral hemispheres and to what extent the left and the right representation interact with one another, three manual reaction-time experiments with different types of numerals (arabic numbers, word numbers, and bargraphs) were run. In all experiments, a target was displayed in one visual field, simultaneously with a distractor stimulus of the same type in the opposite visual field. The target stimulus was indicated by an arrow at the fixation location. Participants were instructed to judge whether the magnitude of the target stimulus was smaller or larger than three. In none of the experiments did we obtain evidence for a VHF difference which suggests that number magnitude is bilaterally represented. There were significant interactions between the magnitude of the target and distractor indicating that the left and the right representations are strongly intertwined. The data are in line with Dehaene's (1992) triple-code model which assumes that number magnitude is bilaterally represented and that both representations are strongly interconnected via the corpus callosum.

Department of Experimental Psychology, University of Gent, Henri Dunantlaan 2, B-9000 Gent, Belgium

[81] Cognitive control and the costs of task shifting: Do shift costs pertain to task preparation or to task performance?

K. Richard Ridderinkhof

When one can perform the same task repeatedly, the 'task set' (the sets of task instructions, of possible stimuli and responses, and of stimulus-response mapping rules) can be kept active in working memory. When one has to switch from one task to another, the old task set must be de-activated and a new one must be implemented. This takes time: the so-called shift costs. In the literature it is often assumed implicitly that shift costs pertain to task preparation. This assumption is tested both for the 'shifted-from' and the 'shifted-to' tasks in the present study. The following questions may be asked: 1) Does a task shift affect the PREPARATION of the new task, or the PERFORMANCE of that task? 2) Do shift costs emanate from having PREPARED a different task just before, or from having PERFORMED a different task? These questions were addressed in a study of multiple-task preparation. The results indicate that 1) compared to a repetition of tasks, a shift of tasks slows the preparation (not the execution) of a new task; and 2) this shift cost occurs only when on a preceding trial a different task was actually performed, not when it was merely prepared.

Department of Psychonomics and Department of Developmental Psychology, University of Amsterdam, Roetersstraat 15, NL-1018 WB Amsterdam, The Netherlands

[82] Shared phonological processes and representations in bilingual speakers.

Ardi Roelofs

In this talk, I present four form-preparation experiments that investigated whether processes and representations are shared at the level of phonological encoding in bilingual speakers. The research was conducted with Dutch-English bilinguals. Experiment 1 showed that in second language production, as in first language generation (cf. Meyer, 1990 JML, 1991 JML), speakers can preplan initial segments of a word without knowing the remainder of a word, but they cannot preplan non-initial segments of a word without also knowing the preceding segments. Experiments 2 and 3 showed that speakers can preplan initial segments common to both languages without knowing the language of the word that has to be produced eventually. Finally, Experiment 4 showed that preplanning requires advance knowledge of the segments and that knowledge about most of their features is insufficient. These results suggest that both the first and second language are phonologically planned in a rightward incremental fashion and that the representations of segments common to the languages are shared. The results are interpreted within the framework of a bilingual version of the WEAVER model of spoken word production (e.g., Roelofs, 1997 Cognition). I present bilingual WEAVER simulations of the experiments.

Washington Singer Laboratories, School of Psychology, University of Exeter, Perry Road, Exeter EX4 4QG, United Kingdom

[83] Children's memory for events: The influence of familiarity and presentation mode.

This study examines how content familiarity and presentation mode influence what children remember of events. One hundred and eighty five children aged 8, enrolled in an elementary school, were randomly assigned to one of 9 experimental groups. They were exposed by means of three different presentation modes (audiovisual, audio, visual) to a novel scene referring either to a familiar or to an unfamiliar event. Three levels of event familiarity were considered: a) the event was familiar, b) the event was unfamiliar, c) the event was previously unfamiliar but children had been tutored to help them build an event representation before exposure to the scene. Following the event presentation they were asked to complete a recognition and a free recall task. Results indicate that performance in the recognition test is influenced both by the level of familiarity and by the presentation mode. These effects vary according to the type of information considered (actions, dialogues, character- or context-related objects). Performance was highest with the familiar event and lowest with the audiovisual presentation mode. In the free recall task the presentation mode had no significant effect on performance while a significant beneficial effect of tutoring emerges on the recall of unfamiliar events.

Clelia Rossi-Arnaud
Barbara Turella
Maria Verrocchio

ECONA and Department of Psychology, University "La Sapienza", Via dei Marsi, 78, I-00185 Rome, Italy

[84] Cognitive load and the processing of feed-back in oral instructions.

Christian Roßnagel

Earlier studies had demonstrated that the cognitive load imposed by giving oral instructions may interfere with linguistic partner-adaptation and responding to listeners' check-backs. Two experiments investigated the system of such interference and whether it is systematically related to the processing of addressees' check-backs. In both experiments, speakers gave instructions on the assembly of a machine model under dual-task conditions by pressing a key each time one of two lights had flashed in a specific sequence. Data from the first experiment indicate that interference—as measured by key-pressing latencies—was greater when speakers detailed specific assembly steps than when they referred to components of the model. In the second experiment, feed-back from the listener was varied both with regard to position and type: addressees checked back specifically ("How do I...") and unspecifically ("uhuh?!") both with reference to assembly steps and to names of model components. The main result was that specific check-backs referring to component names were most often responded to with reformulations and additional information securing the addressee's comprehension. On the contrary, unspecific check-backs with regard to assembly steps lead significantly more often to simple repetitions or were even ignored. Results support a mental model view of text production.

Institute of Cognitive Psychology, Freie Universität Berlin, Habelschwerdter Allee 45, D-14195 Berlin, Germany

[85] Two kinds of configural processing: Developmental and neuropsychological studies.

Romke Rouw

Beatrice de Gelder

The face inversion effect (upside down presentation disturbs face recognition more than object recognition) has been explained by referring to the special importance of configurational information in face recognition. In an earlier paper (De Gelder & Rouw, submitted) we contrasted performance of two prosopagnosic patients on a face inversion task. Developmental prosopagnosic AV showed no effect of inversion, while acquired prosopagnosic RP showed an inversion superiority effect. While configural processing seems completely lost in AV, RP has some spared and some impaired configural processes. The present study is a follow up of that result. We argue that RP's performance reflects impaired expertise-dependent configural processes, with intact expertise-independent configural processes. In this paper we compared RP's performance with that of children and normal adults. Our first finding supports the correspondence between RP's and the children's pattern of configural processing: identical performance on a task, showing disproportionate distraction from hair on a face recognition task. Next, we compared results on one task of configural encoding (encoding the whole face) which we believe is expertise-independent, and another task of configural recognition (the relative influence of face class on encoding the face configuration) which we believe is expertise-dependent.

Department of Psychology, Tilburg University, P.O. Box 90153, NL-5000 LE Tilburg, The Netherlands

[86] Apperception and search in complex problems.

Pertti Saariluoma

Department of Psychology Cognitive Science, University of Helsinki, Box 13, SF-00014 University of Helsinki, Finland

The conceptual information integration during representation construction used to be called apperception by a number of pre-experimental psychologists. Chess provides a particularly good task environment to study apperceptive processes, because in chess people must select among millions of alternatives to find one single good move. Human selective capacity in this context is astonishing, when computers generate millions of alternatives people seem to reach equal level of performance by generating less than a fifty moves. In this paper I am interested in investigating apperceptive processes in very complex chess problems which are much so difficult that solving them, may take days or weeks. In this paper we are interested in empirical analysis of this kind of problems. This means a substantial increase in difficulty and also change in problem solving process. However, the main functional principles of attack, defence etc., which are important in generating mental spaces during chess players problem solving process seem to be as valid as in shorter problem solving processes. These findings give support to the earlier analyses of the generation of human problem spaces. This means that a small set of tacit principles explains why human chess players with their fifty generated moves in ten minutes are able to compete with computers who generate hundreds of millions moves a second. The principles explain, how people can find essential moves instead of a vast mass of irrelevant moves. The discussion also gives a good understanding into the specificity of human thinking compared to computer search processes. On this ground also the differences between psychological and artificial intelligence approaches to problem solving will be analysed.

[87] Onsets and rime units in the reading process of beginning Dutch readers.

Dominiek Sandra
Astrid Geudens
Helena Taelman

Research in English suggests that children use onsets (e.g., p in pet) and especially rimes (e.g., et in pet) as reading units from the early stages of reading development (see Goswami, 1998). Unlike transparent orthographies such as Dutch, English is highly irregular at the level of isolated letters (graphemes) and sounds (phonemes), but becomes far more predictable on the level of onsets and rimes (Treiman et al., 1995). For that reason, orthographic rimes may be critical reading units in English but not in Dutch (Goswami et al., 1998). In a series of experiments we investigated whether Dutch first-graders make use of onsets and rimes spontaneously. The extent to which onsets and rimes were emphasized in the reading method was varied. If children are sensitive to the instruction factor, their use of subsyllabic units should reflect this different emphasis. Besides reading instruction, we incorporated the factor reading skill in our study as well, since good and poor readers might adopt different reading strategies. To test our hypotheses two experimental techniques were used: (pseudo)word distortion by means of spaces and cluster frequency manipulation of body (e.g., pe in pet) and rime. Thus far the results indicate that onsets and rimes are not relevant as reading units for beginning Dutch readers, disregarding the preference for onsets and rimes in one of the reading methods. As to reading skill, a different pattern for good and poor readers was found.

University of Antwerp, UFSIA, Room D 124, Prinsstraat 13, B-2000 Antwerpen, Belgium

[88] Noun morphology in German language production.

Niels O. Schiller
Alfonso Caramazza

Models of speech production (e.g., Levelt, Roelofs, & Meyer, 1999) assume that to produce a word not only a lexical node has to be selected but also "diacritic parameters" have to be set. For nouns, these parameters include, for example, number, gender, and case. In order to produce the morphologically complex form of a word several processes have to be carried out. To generate the plural of a noun, for instance, the lexical concept of that noun has to be activated and, in addition, the concept of multiplicity. Then the lexical node for the noun has to be selected, together with the diacritic feature "plural". The lexical node with its plural feature then activates their corresponding phonological representations. We present the data of two experiments that investigated the effect of number congruency with the picture-word interference task in German. Participants were asked to name target pictures while ignoring distractor words inside the pictures. Pictures had to be named either in the singular or in the plural, and distractor words either had the same number as the target (number-congruent condition) or differed in number from the target (number-incongruent condition). Based on the above-mentioned models, naming latencies should be slower in the number-incongruent condition than in the number-congruent condition due to interference at the number node level. In fact, this type of reasoning has been used to account for the gender interference effect in Dutch (Schriefers, 1993). However, in our experiments no such interference was found. The fact that a semantic interference effect emerged shows, however, that participants processed the distractor words up to a lexical level. The results are discussed in the context of current models of speech production.

Cognitive Neuropsychology Laboratory, Department of Psychology, Harvard University, 33 Kirkland Street, William James Hall 918, Cambridge, MA 02138, USA

[89] Mental models, rules and biases in conditional reasoning with negations.

We report meta-analyses on reasoning with negations. We begin by considering how Mental Model (MM) and Rule Based (RB) theories might account for Type A effects (i.e., effects of negation in the part of the conditional about which an inference is made) in terms of two extant hypotheses concerning the source of such effects (Double Negations Elimination: DNE; and Negative Conclusion Bias: NCB). It is argued that NCB can provide a sufficient account of extant Type A effects within both MM and RB theories, while DNE can provide a sufficient explanation of Type A effects within MM theory but not within RB theory. We further show that the pattern of Type B effects (i.e., effects of negation in the part of the conditional from which an inference is made) cannot be accounted for by MM or RB theories in terms of DNE or NCB. Finally, we demonstrate that within MM theory, a novel 'availability' hypothesis may account for Type B effects, and that Type A effects are most readily explained in terms of a combination of availability and DNE. We conclude that MM theory provides a more parsimonious account of reasoning with negations than RB theories.

Walter Schroyens
Walter Schaeken
Géry d'Ydewalle

Laboratory of Experimental Psychology, University of Leuven, Tiensestraat 102, B-3000 Leuven, Belgium

[90] Learning to produce a sequence of stimuli is easier than learning to respond to a sequence of stimuli.

Albrecht Sebald
Joachim Hoffmann
Christian Stöcker

In a serial reaction time task (SRT), subjects have to respond to stimuli usually presented in serial order. The justification for introducing this paradigm originally might have been the consideration that everyday behavior often consists of action sequences to be executed in a fixed serial order as well. In contrast to everyday behavior, however, subjects in an SRT do not perform actions in order to achieve any goal other than decreasing RTs. In order to allow goal oriented behavior in a SRT, each response was followed by a redundant effect (a tone). At the Xth $\mathcal{ESC}_o\mathcal{P}$ Conference we reported that such redundant effects indeed remarkably improved serial learning: Subjects seem to learn sequences of effects they produce more easily than sequences of stimuli they merely have to respond to. This time, we report experiments which further examine this improvement of serial learning by contingent response effects. The main variables were i) the serial structures to be learned, ii) the mapping of effects to responses, and iii) the modality of the effects. The results confirm the phenomenon and specify the conditions under which it occurs. Conclusions regarding the underlying learning mechanism are discussed.

Psychologisches Institut III, Universität Würzburg, Röntgenring 11, D-97070 Würzburg, Germany

[91] A jigsaw puzzle theory of memory.

A framework for handling a wide variety of memory retrieval phenomena is presented. It starts with the idea that when an episodic memory is retrieved for the first time it is synthesized from memory fragments, and this synthesis is achieved via simulated annealing. The model can offer novel perspectives on false memories, feelings-of-knowing, slips of the tongue and tip-of-the-tongue states, individual differences relating to ageing, depression and post-traumatic stress disorder, and the non-monotonic relation between cue size and performance.

Philip T. Smith

Department of Psychology, University of Reading, Earley Gate, Whiteknights, Reading RG6 6AL, United Kingdom

[92] Simon effects in serial RT tasks: An attention-shift account.

Eric Soetens
Wim Notebaert
Annemie Melis

Recent research provides strong evidence that stimulus-response compatibility and Simon effects can best be explained by a two-route system, consisting of a fast automatic response-priming route, and a slower, response identification route. Stoffels (1996) showed that compatibility effects disappear when the preceding trial was incompatible. This effect has been explained as the blocking of the automatic response priming route because the subject is unsure about the next required response. We demonstrate that the same blocking effect also appears in a Simon task when the preceding trial is noncorresponding. However, the effect is different for response repetitions and alternations. We claim that the blocking mechanism is insufficient to explain the observed modulations of the Simon effect. In a series of two-choice reaction-time experiments with a short response-stimulus interval (RSI = 50 ms) we show that the Simon effect only appears when the location of the stimulus is shifted. When the stimulus is repeated at the same location, no Simon effect is observed, independent of whether the response is repeated or alternated. An efficient explanation of the effects is provided on the basis of the attention-shift hypothesis (Stoffer, 1991) in combination with repetition effects of stimulus and response dimensions.

Cognitive and Physiological Psychology, University of Brussels, Pleinlaan 2, B-1050 Brussels, Belgium

[93] Phonological priming in spoken word recognition with bisyllabic targets.

Three experiments were carried out to examine phonological priming effects on bisyllabic target words. In Experiment 1, using a unimodal paradigm, with prime and target presented auditorily, and lexical decision as task, facilitation was found for beginning and final overlap with monosyllabic prime words ("ver"-VERTIGE; "tige"-VERTIGE). In Experiment 2 with a crossmodal (auditory-visual) paradigm, the initial overlap facilitation effect was replicated when primes were monosyllabic words, but not when they were bisyllabic ("verger"-VERTIGE). No effect was found for final overlap. These results are interpreted in terms of activation and elimination of candidates. In Experiment 3, the initial overlap facilitation effect obtained with cross modal presentation for partial priming was also found using a naming task.

Elsa Spinelli
Juan Segui
Monique Radeau

Cognitive and Brain Science Unit, Medical Research Council, 15 Chaucer road, CB2 2EF Cambridge, United Kingdom

[94] Intentional fixation in learning.

Armin Stock
Joachim Hoffmann

In the present experiments, subjects are confronted with a start symbol and a goal symbol on a computer screen in each individual trial. They are asked to choose an action from four possible alternatives which would result in a second presentation of the goal symbol (mimicking the production of a desired goal state). Under different conditions these "mini-problems" are to be solved either by choosing the correct action in dependence on the start symbol, on the goal symbol, or on both. Another critical variation regards the feedback: subjects either receive feedback only about whether the action was successful or not or about the concrete effects of their actions (i.e., the symbols produced by each action under each start symbol condition) are presented on the screen. Results show that unspecific feedback supports S-R learning, whereas specific feedback supports Response-Effect learning. Moreover, if our subjects experience the concrete effects of their actions, they seem to be so fixated on searching for consistent action-effect relations that learning simple S-R relations was nearly completely suppressed, which is reminiscent of the effects of functional fixation in problem solving. The phenomenon is discussed in the light of a general theory of the control of intentional behavior.

Department of Psychology, University of Würzburg, Roentgenring 11, D-97070 Würzburg, Germany

[95] The instantiation principle re-evaluated.

Three experiments will be reported in which Heit and Barsalou's (1996) instantiation principle will be re-evaluated. In a first experiment, one of the experiments of Heit and Barsalou is replicated to evaluate their assumption that categories are instantiated by a single exemplar. A second and a third experiment investigated whether the instantiation principle can also be applied to explain typicalities at hierarchically lower levels than the concepts studied by Heit and Barsalou.

Gert Storms
Els De Wilde
Wim Ruts

Department of Psychology, University of Leuven, Tiensestraat 102, B-3000 Leuven, Belgium

[96] The influence of spatial compatibility on exogenous and endogenous saccades.

Els Stuyven
Peter Dejonckheere
Mandy Ghyselinck

Saccadic eye movements can be triggered by a peripheral or a central cue. It is assumed that a peripheral cue elicits automatic prosaccades while a central cue leads to endogenous saccades. The latter require prefrontal cortical activity. In a dual-task situation, therefore, a secondary task requiring executive control is expected to impair endogenous saccades, but not automatic ones. The present study reports response-response compatibility effects in the ABBA paradigm. The influence of a manual choice reaction time task, the to-be-postponed task, on speeded automatic and intentional saccade tasks was studied. The spatial component of stimuli and responses of both tasks were manipulated in order to examine whether the compatibility effects were comparable for exogenous and endogenous saccade tasks. Results suggest that for endogenous saccades an action-concept is formed, indicated by the higher latencies for saccades in response-response compatible trials. In the exogenous prosaccade task, no compatibility effects were found. This confirms the hypothesis of Hommel's Action-Concept Model (1996) that there is no need for action plans when performing automatic tasks.

Department of Experimental Psychology, University of Gent, Henri Dunantlaan 2, B-9000 Gent, Belgium

[97] Lexical access in spoken Italian is syllable based?

Three cross-modal, lexical decision experiments were conducted to test the predictions of the syllabic hypothesis, according to which in Romance languages, such as Italian, lexical access during spoken language comprehension is syllable based. In Experiment 1, Italian listeners were auditorily presented with the initial CV syllable of a word (e.g., /ka/ from ca#ne). The syllable was either long or short, and was either stressed or unstressed. At the offset of the syllable, listeners performed a lexical decision task on a visual target (e.g., GATTO-CAT). In the test trials, the string was always a word which was either semantically related to the word the syllable was obtained from or had no relation to it. The results showed that, regardless of length, only stressed syllables produced priming on the related targets. Experiment 2 ruled out the possibility that unstressed syllables were not appropriate primes. Finally, Experiment 3 showed that CV fragments (e.g., /da/) obtained from stressed CVC syllables (e.g., dar#do-dart) primed visual targets related to words whose initial syllable is CV (e.g., da#do-die). These results pose serious problems to the syllabic hypothesis, at least with respect to the process of lexical access.

Patrizia Tabossi
Simona Collina
Michela Mazzeti
Silvia Sbisa

Department of Psychology, University of Trieste, Via dell'Università 7, I-34123 Trieste, Italy

[98] Categorization with an explicit rule: Modeling the effect of associated properties in a connectionist framework.

Jean-Pierre Thibaut
Axel Cleeremans

In typical categorization tasks, people learn to classify exemplars according to simple and fully explicit rules that describe which features in each exemplar define category membership. Categorization, however, may also depend on similarity to stored exemplars. Thus, both category-defining concepts as well as similarity may influence performance on novel exemplars. For instance, Thibaut, Lemaire and Quadri (1998) showed that participants who had learned an easy and explicit rule for categorization were also influenced by properties associated with this rule even though they had not noticed the presence of this association. However, in a way reminiscent of the Stroop effect, the influence of associated properties was asymmetrical in the sense that associated properties a' and b' influenced the expression of the explicit properties A and B, whereas the reverse was not true. In this paper, we provide a connectionist account of this asymmetry based on the model developped by Cohen, Dunbar and McClelland (1990) for the Stroop effect. Implications for models of concept learning are discussed.

Faculty of Psychology, University of Liège, 5, boulevard du rectorat, Bat 32, B-4000 Liège, Belgium

[99] Written word processing in deaf and hearing Spanish people.

The causal relationship between phonological awareness and the intervening systems with deaf people is not sufficiently studied in Spanish. Nevertheless everybody presumes that deaf people read badly because they have no phonological representation. Our first aim in this research is to know and compare phonological processing in Spanish deaf and hearing pupils and so advance the knowledge of the causes of reading failure generalised in deaf people. This study is centered in how deaf children use the phonological assembler in Spanish. 60 hearing and 79 prelingual profoundly deaf children (divided in four groups on the basis of different methods in which they were rehabilitated) were compared in a task assessing phonological awareness and reading and spelling skills in Spanish. Each one of these varieties of linguistic interventions was expected to have a different influence on the phonological awareness. Results did not support the hypothesis that Spanish deaf are poor readers because they have low performance in phonological awareness. Perhaps in Spanish there are other variables, different from the specific reading, which cause the low reading level in the deaf students. Further study is necessary.

Santiago Torres
José Miguel Rodríguez-Santos
Javier Garcia Orza
Rafael Santana

Facultad de Psicología, University of Malaga, Campus de Teatinos, E-29071 Malaga, Spain

[100] On the temptation to break the rules: Can preschoolers' cope?

John Towse
Jo Redbond
Carmel Price
Sue Cook

When three-year-olds are asked to make responses according to a simple rule—sorting cards by well-defined criteria—they show excellent initial performance. However, there are several demonstrations in the literature that, when asked subsequently to use a second, conflicting, rule, young children experience substantial difficulties. Although they can articulate the new rule correctly, their behavioural responses are inappropriate. The dissociation between knowledge and action has been taken to suggest that three-year-olds lack the representational flexibility to embed rules hierarchically. That is, their difficulties in switching between two incompatible rules have been argued to reflect limitations in the way representations are controlled. This conclusion, if correct, has substantial implications for our understanding of false-belief tasks and 'executive' behaviour. Previous research motivates a series of studies that (a) demonstrate preschoolers' success at handling conflicting rules; (b) identify some of the experimental conditions leading to incorrect responses; (c) explore individual differences in performance; and (d) consider in more detail both knowledge questions and sorting requests given to the child. Data provide the basis for an alternative and more generous description of the representational sophistication of young children.

Department of Psychology, Royal Holloway University of London, Egham, Surrey TW20 0EX, United Kingdom

[101] Complex graphemic units in lexical decision in deaf children.

Our purpose was to observe the interaction between the alteration of complex graphemic units and pseudohomophone effects in lexical decision, 1) in children without deficits ; 2) in deaf children as a function of their abilities to perceive and produce oral language. Fifty-four hearing children (from 2nd grade to 5th grade) and 24 deaf children (mean lexical age 3rd grade) participated. They had to decide whether items were words or not (pseudo-words). Half pseudo-words were pseudo-homophones (PH) constituted from high frequency source words; half were control pseudo-words (equal number of orthographic neighbours for PH and PC). Moreover, words and pseudo-words were presented either with spaces respecting the complex grapheme boundaries (e.g., CH AI ZE) ; either with spaces inside the grapheme (e.g., CHA IZ E). A pseudo-homophone effect was found for hearing and for deaf children, especially deaf children having good "speech levels". The role of complex graphemic units in word reading is discussed.

Catherine Transler
Jean Emile Gombert
Jacqueline Leybaert

Laboratoire de Psychologie Expérimentale, Université Libre de Bruxelles, CP 191, B-1050 Bruxelles, Belgium

[102] Talking about your life: How to distort your own memory?

Barbara Tversky
Elizabeth Marsh

When people retell events they have experienced, they often do so from a specific perspective or for a certain effect. Memory diary data show that people report they frequently distort events when they retell them. Do distorted retellings bias memory for the original events? A series of experiments varying retelling perspective shows that they do.

Department of Psychology, Stanford University, Bldg. 420, Stanford, CA 94305-2130, USA

[103] Automatic reading is not constrained to the direct route.

Subjects were trained in "reading" strings of unfamiliar figures. Training included 4320 trials. In one experiment subjects were trained on the same 72 strings: nonwords, neutral words or color names. In another experiment, a different string was presented in each trial. Strings that resulted in color names or started like color names were not included in training. Both experiments resulted in automatic reading, as indicated by a Stroop effect. This demonstrated that automatic reading might reflect either the direct or the compositional route.

Joseph Tzelgov
Marlen Baron
Vered Yehene

Department of Behavioral Sciences, Ben Gurion University of the Negev, Beer Sheva, Israel 84105

[104] Effects of task-set size on switching costs.

André Vandierendonck
Bernie Caessens
Gino De Vooght
Koen Van der Goten

Studies of task-switching generally show a drop in both the speed and accuracy on switch trials (Allport, Styles and Hsieh, 1994; Rogers & Monsell, 1995). These results indicate that simple SR-tasks are organised in distinct task-sets, and that engagement and disengagement of such a set requires cognitive control. We report some studies which further investigate task-set configuration. The question adressed is whether a task-set can include several SR-mappings, or whether each SR-mapping needs a distinct task-set. A series of experiments will be reported in which the participants switched between four tasks grouped into two subsets. Tasks in one subset were presented in close spatial and temporal proximity so as to favour grouping of task-sets. The results obtained with this four-tasks design show larger switch costs between than within task-sets, and faster performance for the second task whithin a set than for the first one. These results will be compared with task-performance within a simple AABBAABB design, and discussed in the framework of task-scheduling and task-set configuration.

Departement of Experimental Psychology, University of Gent, Henri Dunantlaan 2, B-9000 Gent, Belgium

[105] Implicit transsaccadic memory for saccade source and target.

When participants make a saccade from one biological-motion figure to another figure, saccade-contingent displacements of the walker to which the eyes were sent (the target) or the walker that served as launch site (the source) are hard to detect, whereas changes in the walkers' depth orientation are readily noticed. Changes in the target's position and orientation are not detected more accurately than changes in the source. We report on a test of the hypothesis that, in contrast to what these findings suggest, transsaccadic coding of target position is in fact accurate, but the information is unavailable to conscious perception, because the visual system assumes the world remains stable. Deubel et al. (Vision Research, 1996) demonstrated that, by briefly blanking the saccade target during and just after the saccade, the default assumption of a stable visual world is invalidated and saccade-contingent displacements are relatively easy to detect. We test the hypothesis of an implicit transsaccadic advantage for the target over the source, by examining the effects of blanking on the detectability of source vs. target changes.

Karl Verfaillie
Peter De Graef
Veerle Gysen

Department of Psychology, University of Leuven, Tiensestraat 102, B-3000 Leuven, Belgium

[106] Effect of stimulus identification and distance variation on the right hemisphere advantage for the processing of coordinate spatial relations.

Marie-Pierre Vernier
Olivier Koenig

Kosslyn et al. (1989) reported that coordinate spatial relations are computed faster by the right hemisphere (RH), whereas categorical spatial relations are computed faster by the left hemisphere (LH), which demonstrated that distinct subsystems process each type of relations. Moreover, they found that the RH advantage for the processing of coordinate relations disappeared with practice. They suggested that this might be due to the development of new categorical representations processed by the LH. It is important to notice that subjects need to identify each stimulus prior to making categorical judgments, whereas identification is not required for coordinate judgments. The aim of the present study was to assess the role of stimulus identification on spatial relations judgments and to further explore the above effect of practice. Four experiments were conducted. The first experiment explored the role of stimulus identification. The usual task by hemisphere interaction observed revealed that the need of stimulus identification was not the cause of the LH advantage for the processing of categorical relations. The other three explored the conditions under which the RH advantage can be maintained with practice for coordinate judgments. Subjects had to decide whether a dot was within a critical distance from a bar. This distance changed every three trial blocks, every block, or every trial. Results showed that a RH advantage was maintained in the case the critical distance changed from trial to trial only.

Cognitive Psychology Laboratory, University of Lyon 2, 5 Avenue Pierre Mendes-France, F-69676 Bron Cedex, France

[107] Implicit and explicit tests of memory for natural objects.

We report four experiments examining dissociations in performance on implicit and explicit tests of memory for natural objects. In Experiment 1, subjects named black-and-white and coloured versions of common objects and subsequently either (a) named the same object, the same object but changed from black-and-white to colour and vice versa, or new objects or (b)performed a recognition judgement. Experiment 2 used the same paradigm but with congruently and incongruently coloured objects. Experiment 3 replicated Experiment 2, but with coloured object decision at test (i.e., deciding whether the object was correctly coloured or not). Experiment 4 replicated Experiment 3, but with coloured object decision at study and test. Study responses were shorter to correctly coloured objects, suggesting colour was encoded. For the implicit tests in Experiments 1–3, repetition priming was equivalent for same and changed conditions relative to the new baseline condition. In Experiment 4 however, there was priming only for objects that remained the same. For the explicit test in Experiments 1–4, objects that remained the same were recognised faster than objects that changed from study to test. We discuss these results in terms of structural object representations (e.g., Biederman & Cooper 1990, 1991), transfer appropriate processing (e.g., Kolers & Roediger,1984), and the components of processing (e.g., Moscovitch, 1994).

David Vernon

Toby Lloyd-Jones

Psychology Department, University of Kent, Canterbury, Kent, United Kingdom

[108] Gender agreement in language production I: When sex hits syntax.

Gabriella Vigliocco
Julie Franck
Simona Collina

Does non-syntactic information influence the syntactic encoding of a sentence during production? We investigated whether a syntactic operation (gender agreement between the subject of a sentence and a predicative adjective) is affected by conceptual information about the sex of the referent in Italian and French. In both languages, nouns are marked for gender, the correspondence between the gender of the noun and the sex of a referent is either transparent, absent or opaque. In both languages we find nouns such as "vittima" [victim-F], referring either to men or women. We manipulated the relation between syntactic and conceptual information: (1) match between sex of the referent and gender of the noun (e.g., when the word "vittima" refers to a woman); (2) mismatch ("vittima" refers to a man); (3) no information about the sex of the referent ("vittima" out of context). Our dependent measure was the number of gender agreement errors produced. Errors were most common when there was a mismatch, intermediate when there was no information about the sex of a referent and least common when there was a match. Implications for models of sentence production are discussed.

Department of Psychology, University of Wisconsin-Madison, 1202 W. Johnson Street, Madison WI 53706, USA

[109] A comparison between predictions and reaction times in implicit sequence learning.

In the simple recurrent network (SRN) model, proposed by Cleeremans and McClelland (1991) to describe implicit sequence learning, the distinction between reaction time and prediction of the next trial is somewhat blurred. That is, the reaction time of the network is taken to be inversely proportional to the activation value of the corresponding neuron. In order to investigate the difference between ability to predict following stimuli and reaction times, we study implicit sequence learning in a similar vein as done by Cleeremans and McClelland (1991), using a sligthly less complex grammar than they did. In addition we ask subjects to guess where the next stimulus will be at randomly chosen trials during the learning process. Moreover, in an attempt to gain a better understanding of both the human learner and the SRN in implicit sequence learning, hidden Markov models are used to characterize an increase in implicit knowledge.

Ingmar Visser
Maartje E. J. Raijmakers
Peter C. M. Molenaar

Department of Psychology, University of Amsterdam, Roetersstraat 15, NL-1018 WB Amsterdam, The Netherlands

[110] Preposed adverbial phrases in processing episode-discontinuous sentences.

Wietske Vonk
Yves Bestgen

Temporal adverbial expressions not only convey temporal information, such as 'the point in time that', 'the period in which', or 'the duration of', but also function as discourse structuring devices. In fact, speakers and writers use such devices to signal episode shifts in a text. A sentence that expresses a new episode requires in general a longer reading time than a sentence that continues the episode, because the reader assumes by default that the sentences are continuous. This effect is called the episode boundary effect. The question is whether this default assumption can be overridden when the sentence contains a segmentation marker, an expression that signals the episode shift. We investigated the effect of two different adverbial phrases in French sentences: a temporal adverbial phrase, such as 'Vers onze heures', and a non-temporal sentence adverbial phrase, such as 'Comme d'habitude' and 'Comme chaque fois'. On the basis of the meaning of these adverbials, only the temporal adverbial phrases are considered segmentation markers. Therefore, only the temporal adverbial phrases are assumed to modify the episode boundary effect. Furthermore, if these adverbials have an effect on the processing of the sentence, they ought to be sentence initial. The results of four reading experiments are reported that indicate that preposed adverbial phrases affect sentence processing in interaction with extra-sentential information.

Max Planck Institute of Psycholinguistics & University of Nijmegen, Wundtlaan 1, NL-6525 XD Nijmegen, The Netherlands

[111] Prior study of an orthographically similar word causes facilitation: Competitive processes re-examined.

Several prominent models of visual word recognition postulate that orthographically similar words or neighbors compete for identification. The competitive process supposedly leads a word to automatically suppress the activation levels of its neighbors. Experiment 1 showed an inhibitory effect resulting from priming with a neighbor, which is in line with the competition hypothesis. In Experiment 2, however, repeated exposure to a neighbor (e.g., MOTHER), resulted in facilitation for the target word (e.g., BOTHER). This facilitatory effect was replicated in Experiment 3. Results from the present experiments using the lexical decision task cast doubt on the existence of lexical inhibition. Experiments 2 and 3 lend support to both the phonological competition hypothesis and the assumption of lexical independence. Implications of these results for models of visual word recognition are discussed.

Eric-Jan Wagenmakers

Jeroen Raaijmakers

Department of Psychonomics, University of Amsterdam, Roetersstraat 15, NL-1018 WB Amsterdam, The Netherlands

[112] Prosodic phrasing and relative clause attachment in a three-site context.

Frank Wijnen
Casper Troost
Hugo Quené

Sentence parsing studies show that attaching a relative clause (RC) to the second noun phrase (NP) in an NP1-prep(osition)-NP2-prep-NP3-RC structure is dispreferred. Gibson et al. (1996) interpret this as the result of the interaction of two principles, Predicate Proximity and Recency Preference. RC-attachment to the second of three NP's violates both. We hypothesize, however, that the NP2-dispreference is due to the fact that the second NP is not in a focus position. A prediction is that it is impossible to assign prosodic prominence to the middle NP. We asked 6 native speakers of Dutch to read aloud 54 sentences that contained the abovementioned ambiguity, and to prosodically disambiguate RC-attachment as prescribed by underlining. The subjects produced consistent prosodic patterns for NP1 and NP3 attachments, but failed to do so for NP2-attachments. Next, we ran an auditory questionnaire study, in which 15 Subject-Verb-NP1-prep-NP2-prep-NP3-RC sentences were presented with three prosodic realisations corresponding to the most frequently used patterns for the disambiguation options in the production study. The listeners (n=25) interpreted 44% of the cases as NP3-attachments, 38% as NP1-attachments and 19% as NP2-attachments. Prosodic phrasing significantly modulated perceived RC-attachment, but the direction of the effects did not mirror the attachment-prosody associations found in production. Notably, none of the phrasings produced a shift of perceived attachment toward NP2. These results support our contention that the middle position in a compound NP cannot be focussed, and therefore resists the attachment of an adjunct phrase.

Utrecht institute of Linguistics OTS, Utrecht University, Trans 10, NL-3512 JK Utrecht, The Netherlands

[113] Imitation in young children: Mapping means or mapping ends ?

In a series of 5 experiments, the predictions and assumption of a new theory of imitation are tested. Current theories of imitation assume a direct visual-to-motor mapping between perceived movements and imitated movements. Based on recent findings regarding systematic errors in imitation, the new theory of goal-directed imitation instead assumes that imitation is guided by cognitively specified goals. The imitator extracts the goals and subgoals of an observed action. These goals and subgoals are then ordered hierarchically with the highest goals being most likely to be imitated correctly. The highest goal then activates the motor program that is most strongly associated with the achievement of that goal. Sometimes this motor program matches the movement of the model, sometimes it does not. However, the goal of the model act is always imitated correctly. The experiments reported widely confirm the predictions of the theory of goal-directed imitation. The implications of the new theory and the role of direct-mapping theories within the framework of the goal-directed theory are discussed.

Andreas Wohlschläger
Harold Bekkering
Merideth Gattis

Max Planck Institut für Psychologische Forschung, Leopoldstraße 24, D-80802 München, Germany

[114] Exemplar based learning and its transfer.

Vered Yehene
Joseph Tzelgov

Memory based approaches to automaticity argue that the representation underlying skilled performance is based on an exemplar learning mechanism, and thus it does not predict transfer of OLD tasks to NEW stimuli (e.g., Logan, 1988). The present study analyzes the components of an exemplar based mechanism in performing NEW tasks on OLD stimuli. During training, subjects practiced performing a lexical decision task with the episodic priming paradigm. Thus, they practiced associating prime-target pairs taken from originally unrelated categories (e.g., Almonds-Cousin, Mexico-Forehead). After the learning phase, two different transfer tests were conducted. The results exemplify what components were represented in the learned exemplars, and which of them underlie automatic performance in the new task.

Behavioral Sciences Department, Ben Gurion University of the Negev, Beer Sheva, Israel

[115] Postmenopausal estrogen use and memory performance.

There is increasing evidence indicating estrogen's influence on memory, particularly tasks that require episodic memory. A cross-sectional comparison assessed episodic memory, semantic memory and procedural memory in 160 menopausal women, 80 of whom were on estrogen replacement therapy (ERT) and 80 of whom were not. Two sexually dimorphic tasks of verbal fluency and block design were also examined. The results demonstrated that women using ERT performed at a significantly higher level on episodic memory tasks. Although ERT users performed better on tasks of semantic and procedural memory, as well as verbal fluency and block design, these results did not reach significance. Examination of episodic scores of ERT users and non-users across the participant age span of 45 to 85 years old revealed that age-related memory decline was evident for both groups, however less severe for estrogen users. Estrogen appears to have a specific influence on episodic memory.

Julie E. Yonker
Agneta Herlitz
Lars-Göran Nilsson

Department of Psychology, Stockholm University, S-106 91 Stockholm, Sweden

[116] On the reality of an inhibition mechanism during word visual recognition.

Daniel Zagar
Stéphanie Mathey

The Interactive Activation (IA) model of McClelland and Rumelhart (1981) gave a nice account of visual word perception. One important aspect of this model is the inhibition mechanism between word-units. This mechanism plays a central role in accounting for the neighbourhood frequency effect (NFE, Grainger, Jacobs, Segui & O'Regan , 1989). However the inhibition mechanism was recently strongly challenged because several attempts to replicate the NFE failed (Forster & Shen, 1996; Sears, Hino & Lupker, 1995). In this talk we'll discuss how the NFE may be hidden by various confounded variables by presenting first, a theoretical account for the inhibition mechanism based on simulations with artificial lexica and second, empirical data that confirm the reality of inhibition.

Laboratoire d'Etudes des Acquisitions et du Developpement& CNRS ESA 5022, Université de Bourgogne, 6 boulevard Gabriel, F-21000 Dijon, France

[117] Is there more than response-effect learning under implicit serial learning conditions?

To explain serial pattern learning under implicit learning conditions, some authors assume that the stimulus sequence is learned (S-S learning). Others ascribe serial learning to the response sequence (R-R learning). Moreover, also response-effect learning can explain serial learning: The next stimulus in the sequence is learned as an effect of the current response (R-S learning). As R-S learning has proved to be a strong learning mechanism, the question is, whether R-S learning would be crucial to serial learning or only an additional mechanism among others. Three experiments investigated the interplay of S-S, R-R, and R-S learning. In Experiment 1, S-S and R-S relations were varied. R-R relations remained constant. Serial learning depended on the complexity of R-S relations, but not on S-S or R-R relations. In Experiment 2, less complex R-R relations were used. S-S relations were varied, R-S relations were held constant. Again there was evidence for R-S learning, but not for S-S learning. Furthermore, the more simple R-R relations resulted in stronger learning effects. Experiment 3 tested R-S against R-R learning. Despite of systematic R-R relations, the occurrence of serial learning depended on the existence of systematic R-S relations. Thus, R-S learning seems to be crucial to implicit serial learning.

Michael Ziessler

Institute of Psychology, Humboldt University Berlin, Oranienburger Straße 18, D-10178 Berlin, Germany

Chapter 5

POSTER SESSION I

[PI-1] Syntactic congruency in word and picture naming.

We present the results of a series of experiments in which we studied the effects of syntactic contexts on the picture naming and word reading tasks. The syntactic contexts were single words of different syntactic classes that could either be gender congruent or incongruent with the target. We first compared the naming of pictures and words. With determiners (e.g., "un/une" ["a" masc/ "a" fem]) as primes. We observed a gender congruency effect in picture naming but not in word reading. Such an effect was absent when adjectives were used as primes instead of the determiners. These results are interpreted in the context of current models of speech production.

F.-Xavier Alario
Juan Segui
Rafael E. Matos

Laboratoire de Psychologie Expérimentale, Université René Descartes and CNRS, 28 rue Serpente, F-75006 Paris, France

[PI-2] Accessing the mental lexicon in written picture naming: Do phonological codes constrain the selection of orthographic codes?

Patrick Bonin
Ronald Peereman
Michel Fayol

The orthographic autonomy hypothesis states that the retrieval of the orthographic codes in written picture naming does not obligatorily require prior access to phonology (Rapp & Caramazza, 1997). This hypothesis is supported by neuropsychological reports (Assal, Buttet, & Jollivet, 1981; Hier & Mohr, 1977) as well as by recent findings from masked priming experiments with normals (Bonin, Fayol, & Peereman, 1998). However, it remains possible that phonological codes constrain the selection of orthographic codes through lexical links or sublexical links. This hypothesis was investigated in two experiments in which participants had to write the names of pictures. In both experiments, consistency of the mapping between the phonological and orthographic codes of the picture name was manipulated. In Experiment 1, consistency was manipulated at the lexical (word) level by using picture names that were either heterographic homophones or nonhomophones. In Experiment 2, consistency was manipulated at the sublexical (subword) level by contrasting picture names which included, or did not include, analytical inconsistencies. No latency advantage for consistent over inconsistent labels was found whereas in both experiments inconsistent labels yielded more errors than consistent ones. The implications of the findings are discussed in the light of models of written picture naming.

Laboratoire de Psychologie Sociale de la Cognition (LAPSCO), CNRS & Université Blaise Pascal, 34 Avenue Carnot, F-63037 Clermont-Ferrand Cedex, France

[PI-3] The agreement of the past participle in number and gender in written French. A developmental study from 7th to 12th grade.

The objective of this work was to analyze the noun-past participale agreement, (1) to analyse its acquisition, comparatively with subject-verb agreement; (2) to compare agreement errors in number with those in gender; (3) to emphasize a control process in writing, activated either by (a) the phonological realization of the verb, conjugated in the present or in the imperfect or by (b) the syntactic construction of the sentences (Noun1 and Noun2 + [to be] + Past participle). The participants' task consisted of writing orally presented sentences. The proportion of errors was computed, both for number and gender. Agreement errors in number were less frequent than those in gender. Errors in number were mainly proximity concordance errors, while errors in gender consisted in agreeing the past participle with the masculine, whatever the two nouns preceding the verb. The tense had no effect. It seemed that a phonological control was not used to avoid agreement errors. In conclusion, the agreement with the past participle can easily be compared with subject-verb agreement. Indeed, proximity errors were the most numerous, and appeared both for number and gender. The automatization of the agreement was very slow, and it operated on the number before the gender.

Lucile Chanquoy

Isabelle Negro

Département de Psychologie, Université Paul Valéry—Montpellier III, Route de Mendes, F-34 199 Montpellier Cedex 5, France

[PI-4] Gender agreement in language production II: When morpho-phonology hits syntax.

Julie Franck
Simona Collina
Gabriella Vigliocco

Does non-syntactic morpho-phonological information influence the syntactic encoding of a sentence during production? In this series of studies we investigated whether the presence of consistent morpho-phonological marking for gender in the subject noun phrase affects the accuracy of computing gender agreement between the subject of a sentence and a predicative adjective in Italian and French. A comparison between Italian and French is interesting because in French, nouns are generally not morpho-phonologically marked for gender (although certain word-endings are more predictable than others with respect to gender) and determiners usually provide gender information (with the exception of nouns starting with a vowel). In Italian, not only the determiner but also noun endings usually provide reliable information regarding the gender of a noun, although there are exceptions. In experiments inducing gender agreement errors, we manipulated the morpho-phonological marking of the determiner (marked vs unmarked) and the amount of information provided by the noun ending in both languages. The dependent measure considered was the number of gender agreement errors produced. In both languages we found that the prevocalic neutralization has an effect on the number of errors produced. However, while in Italian we found an effect of noun ending, this was not found in French.

Department of Psychology, University of Wisconsin-Madison, 1202 W. Johnson Street, Madison WI 53706, USA

[PI-5] The influence of homophone frequency and distance in spelling regular Dutch verbs.

In two experiments, spelling errors against homophenous verbs were related to the frequency of the two homophenous forms and the distance between the verb and the word determining its spelling. Experiment 1 employed homophones that emerge from applying the spelling rules for first and third person singular present tense to stem-final d verbs in Dutch (e.g., [tre:t] for both first <treed> and third person <treedt> singular). Distance was manipulated by using these forms in main clauses and subclauses. The results of a spelling task showed that frequency of the two homophenous forms plays a role with more intrusions of a competing higher-frequent form upon a lower-frequent one. Distance showed an effect with more errors in the subclause in which the information coming from the subject is more difficult to retrieve. Experiment 2 replicated these findings for homophones stemming from the formation of the past participle (e.g., [bedint] for both third person singular present tense <bedient> and past participle <bediend>). These results are interpreted in an interference model for spelling in which the phonologically-driven retrieval process is the locus of the frequency effect and the morphosyntactic rule-component can account for the distance effect. A third experiment made use of a self-paced reading paradigm in which the verb form was either spelled correctly or incorrectly. This way, it was possible to relate the influence of frequency to reading latencies.

Steven Frisson
Dominiek Sandra
Frans Daems

Department of Linguistics, University of Antwerp, Ufsia, Room D123, Prinsstraat 10, B-2000 Antwerpen, Belgium

[PI-6] Children idiomatic expressions processing.

Aurélie Lainé
Lydie Iralde

Studies on comprehension of idiomatic expressions revealed that literal meaning of idioms is understood from 8 years, and that until this age, the child's strategy is essentially literal. According to Iralde and Poncin (1998, in press), when familiar idioms are presented without context in an oral explanation task, a significant change in the child's strategy (from literal to figurative sense) appears between 9 and 11 years old. Moreover, Denhière and Verstigel (1997) assume that both literal and idiomatic meanings are initially computed in adult idioms' processing, and that the intervention of inhibitory links is likely to step in access to the revelant representation.The purpose of the present study is to test the double activation hypothesis from a developmental point of view (children aged 9, 10 and 11 years old and young adults), in taking subject's inhibition capacity into account. In a first session, we evaluate each subject using the WCST, purported to measure inhibitory processes. Then, the subject listens to a short story, infering either literal nonfigurative meaning of an idiomatic expression. Idiom constitutes the last sentence of the story. After that, a target sentence appears on a computer screen, and the subject must appreciate target sentence and idiom meanings concordance, by pressing an appropriatly labeled response key. Target sentences are either literal meaning of the idiomatic expression, either figurative meaning or neutral (unrelated target sentence). Decision time is recorded. Ten stories are proposed to each subject. Idioms have been selected with similarities of familiarity, predictibility and literality. Analysis aims to extract sensitive experimental conditions (notably story infering literal meaning and figurative target sentence), in parallel to WCST performances.

Laboratoire de Psychologie: Cognition, Involution, Développement, UFR Lettres, Langues et Sciences Humaines, 11 Boulevard Lavoisier, F-49045 Angers, France

[PI-7] How are adults of low literacy advantaged or disadvantaged in learning to read and to spell?

This study tried to understand the difference in literacy acquisition between adults of low literacy and children beginning to read and to spell. It could be expected that adults have the advantage of a more elaborate vocabulary and better general linguistic knowledge (syntactic and semantic). A group of adults of low literacy was compared with a control group of reading-level matched children from the same socio-economic level. Both groups were submitted to various tests for estimating their phonological skills, their knowledge of grapho-phoneme correspondence rules, their vocabulary level and their reading and spelling competencies. Moreover, syntactic and semantic abilities were evaluated so as the cost entailed by the grapho-motor processes of writing. The adults of low literacy were impaired on the phonological tasks so as their knowledge of correspondence rules. But these weaknesses were compensated by using specific orthographic strategies for literacy learning and by a higher vocabulary level. The groups differed significantly in the use of strategies to read and to spell. Adults of low literacy seem to behave as Chinese readers and spellers (their phonological processes are more deficient than their orthographic processes). Conversely, children use more alphabetic links between graphemes and phonemes which predict a better evolution.

Christelle Maillart
Marie-Anne Schelstraete

Department of Experimental Psychology (EXCO), Université Catholique de Louvain, Place du Cardinal Mercier 10, B-1348 Louvain-la-Neuve, Belgium

[PI-8] Implicit learning of morphology and graphotactic regularities affect children's and adults' judgments of nonwords.

Sébastien Pacton
Michel Fayol
Pierre Perruchet

This study investigates French children (Grades 2, 3 and 5) and undergraduates' sensitivity to graphotactic associations (GA) and morphology through a judgment task of nonwords. As soon as in Grade 2, judgments were affected by the frequency of the different graphemic forms of the final sounds /o/ and /et/ as a function of the preceding consonants (a GA frequency effect). Including nonwords into sentences in order to specify that /o/ or /et/ stands for a diminutive affected children's judgments from Grade 3 onward (a morphology effect). For instance the sound /o/ of the nonword /mitaro/ was more often transcribed eau when it was included into a sentence (a little /mitar/ is a /mitaro/) than when it was not (a /mitaro/). However, despite the transcription of /o/ and /et/ when they are diminutive morphemes can be described with a rule (e.g., /o/ is spelled eau when it is a diminutive), GA frequency effect persisted in the "diminutive" condition even in the undergraduates group, suggesting that adults' morphological knowledge differed from the above mentioned rule. The results are discussed in relation to learning to spell literature and are related to more general theories of implicit learning.

LEAD/CNRS, 6 boulevard Gabriel, F-21000 Dijon, France

[PI-9] Immediate recall of auditorily presented sentences is based on phonological representations.

Ralf Rummer
Manuela Schrobildgen

Potter and Lombardi (1990) showed that words that are semantically similar to nouns of an auditively or visually presented sentence intrude into sentence recall if presented in an unrelated word list (given either before or after the sentence). The authors interpreted this finding in terms of the conceptual regeneration hypothesis. This hypothesis states that sentence recall is based on conceptual information whereas the role of phonological information is negligible. This general interpretation is questionable because auditive presentation was only realised in the word-list-after-sentence condition. By presenting neuropsychological data from a patient with an impaired phonological working memory and who was unable to verbatimly recall auditively presented sentences whereas performance in sentence-picture matching was nearly perfect, Martin (1993) showed that the presentation mode may be critical for the involvement of phonological information. To demonstrate the involvement of phonological information in recall of auditively presented sentences we used Potter and Lombardi's intrusion paradigm. Participants were either presented with auditive or visual material. Under both conditions the word list was presented before the sentence. As expected the intrusion effect was only found for the visually but not for the auditively presented material. This finding provides evidence for the assumption that phonological information plays an important role in immediate recall of auditively presented sentences.

Psychology, University of Saarland, P.O.Box 151 150, D-66041 Saarbrücken, Germany

[PI-10] Explaining noun-verb dissociations: A system of feature-based lexical representation.

David P. Vinson
Gabriella Vigliocco

We assume that semantic representations consist of bundles of features, including perceptual and functional. Further, we assume that features are bound into localist lexico-semantic representations (lemmas, after Kempen & Huijbers, 1983), which are categorically organized: both semantic categories (e.g., animate/inanimate, animals/tools, etc.) as well as grammatical categories (e.g., the noun/verb distinction; or transitive/intransitive verb distinction). We asked native speakers of English to generate features for nouns and verbs, following (e.g., Hinton & Shallice, 1991), and used commonly-occurring features for each word to define the semantic space. Then, following Zorzi et al. (in press) and Miikkulanen (1997), we used self-organizing maps (Kohonen, 1995) to examine the emergent properties of the resulting lexical space. Not only did we replicate Zorzi et al.'s finding that nouns exhibit category organization, we also found a strong noun-verb dissociation and a dissociation between intransitive and transitive verbs. We discuss the plausibility of this hypothesis as an alternative explanation for category (both semantic and grammatical) specific deficits and for semantically related word substitution errors in production. We further explore how such a system can develop representations for new concepts.

Department of Psychology, University of Wisconsin-Madison, 1202 W. Johnson, Madison WI 53706, USA

[PI-11] Coordination of syntactic structure in dialogue.

We present evidence from two experiments employing a novel "confederate-priming" technique which show that speakers coordinate the syntactic structure of their contributions in dialogue. Pairs of speakers took it in turns to describe pictures to each other. One speaker was a confederate of the experimenter and produced scripted descriptions that systematically varied in syntactic structure. In Experiment 1, the confederate and subject described pictures involving the same action; in Experiment 2, they described pictures involving different actions. Our results showed that the syntactic structure of the confederate's description strongly influenced the syntactic structure of the subject's immediately subsequent description. When the action was the same, 78% of subjects' descriptions had the same structure as the confederate's descriptions; when the action differed, the proportion was 63%. We interpret these effects in terms of syntactic priming (Bock, 1986). Our results support an account in which priming arises from the repeated use of syntactic information (Branigan et al., 1995), rather than particular procedures (Bock & Loebell, 1990). They are also evidence for a common level of syntactic representation shared between comprehension and production. We identify this with the lemma stratum (Levelt, Roelofs & Meyer, 1999). Our results also argue that coordination in dialogue extends beyond the development of shared strategies for reference (e.g., Brennan & Clark, 1996; Garrod & Anderson, 1987).

Holly P. Branigan
Martin J. Pickering
Alexandra A. Cleland

Human Communication Research Centre, Department of Psychology, University of Glasgow, 53 Hillhead Street, Glasgow G12 8QF, United Kingdom

[PI-12] Evidence against aspects of Frazier and Clifton's construal theory.

Saveria Colonna
Don C. Mitchell
Joël Pynte

In an influential theory of parsing, Frazier and Clifton (1996) claim that a phrase that CAN be treated as a "primary phrase" should be analysed according to the parsing principles such as Minimal Attachment. The present study reports data which are inconsistent with this claim, in the sense that it provides evidence of a bias AGAINST Minimal Attachment in the analysis of a structure that can be taken to instantiate a primary phrase. A questionnaire study and a self-paced reading experiment in English were conducted. We used ambiguous sentences where a pronoun "who" could introduce a relative clause or a sentence complement. According to Construal theory, the ambiguous proposition should be parsed like a primary relation, and according to the Minimal Attachment, preferentially interpreted as a sentence complement.This prediction was not confirmed: the results showed that the participants preferred the relative clause interpretation. These results either question the status of a fundamental parsing principle (Minimal Attachment), or alternatively they challenge the ground rules under which the two classes of phrases are claimed to be handled. In either case they point to the need for revisions in the theoretical framework.

CREPCO, University of Provence & CNRS, 29 avenue Robert Schumann, F-13621 Aix-en-Provence Cedex 1, France

[PI-13] Structure and topic information in expository text overviews.

It is usually recommended to start a text by providing readers with an overview of its content (the topics discussed) and of its structure (the relations between topics). However, in a recent research, Murray and McGlone (1997, Journal of Educational Psychology, 89) reported that readers benefit from topic information but not from structural information provided in an introductory paragraph. In the present experiments, the authors ask whether these observations would be adequate to more complex texts, in which structural information would be more important. Two experiments, using a text with a complex hierarchical structure, replicated previous results on reading times. Experiment 2 also permitted to rule out the effect of numerical signals in the text as the source of this result. Moreover, recall was not affected by information provided in the overview.

Vincent Dupont

Yves Bestgen

Department of Experimental Psychology (EXCO), Université Catholique de Louvain, Place du Cardinal Mercier 10, B-1348 Louvain-la-Neuve, Belgium

[PI-14] The effect of repeated exposure to syntactic structures in the resolution of syntactic ambiguities.

Javier Garcia Orza
José Miguel Rodríguez-Santos

The publication of Cuetos and Mitchell's research (Cuetos & Mitchell, 1988), which shows Spanish people violate the proposed universal principle of Late Closure preferring Early closure, has provoked a revolution in the field of sentence processing. Tuning hypothesis (Mitchell & Cuetos, 1991; Cuetos, Mitchell & Corley, 1996) claims that when the parser finds a choice between structures to build, it favors the one that occurs more frequently. Tuning entails that the relative frequencies of constructions which compete are acquired by experience. However several data fail to support this hypothesis (Mitchell & Brysbaert, 1998). In the present research carried on with Spanish subjects, two experiments investigate the effects of exposure to Late Closure (low attachment) or Early closure (high attachment) over relative sentence disambiguation. Our data demonstrate that people can change their initial preferences for Early closure if they are repeatedly exposed to Late closure (low attachment) structures. Although the data support the role that frequency of exposition to a particular structure plays in sentence processing, we claim that frequency effects are only a variable, but an important one, in the process of disambiguation, and it is insufficient to explain the whole process of syntactic disambiguation.

Departamento de Psicología Básica, Malaga University, Campus de Teatinos s/n, E-29071 Málaga, Spain

[PI-15] Semantic and syntactic processes in auditory sentence comprehension: Evidence from event-related brain potentials.

We investigated the time course and possible interactions of semantic and syntactic processes in auditory language comprehension using event-related brain potentials. In the ERP paradigm correct sentences are frequently compared to anomalous sentences violating one specific linguistic aspect (e.g., semantics, phrase structure). Previous studies had shown an early anterior negativity and a late parietal positivity (P600) in correlation with phrase structure violations whereas semantic integration processes were correlated with a centro-parietal negativity (N400). In a series of four ERP experiments we investigated whether and, if so, how these different processes interact. We did so by (a) studying sentences in which a critical word violated semantic and phrase structure constraints at the same time, (b) varying the participants' task (evaluating either semantic or syntactic coherence) and (c) replacing content words by pseudowords. The combined results suggest that phrase structure violations are detected particularly early and are able to block further semantic processing. However, these semantic processes can be re-elicited by changing task demands.

Anja Hahne

Angela Friederici

Max Planck Institute of Cognitive Neuroscience, Stephanstraße 1A, D-04103 Leipzig, Germany

[PI-16] The difference between eyes and fingers: A method artefact in self-paced reading experiments.

John Hoeks
Wietske Vonk
Pim Mak

Despite a number of obvious disadvantages, self-paced reading (Just, Carpenter, & Woolley, 1982) is still the most frequently used research paradigm in the field of sentence processing. There may, however, be disadvantages that are not that obvious. In the present study we will compare the results from word-by-word self-paced reading and eye tracking experiments (Hoeks, Vonk, Hagoort, & Brown, 1999), that were set up to investigate the processing of temporarily ambiguous sentences. The outcome of this comparison suggests that the self-paced reading method may induce a spurious effect that has nothing to do with syntactic or semantic processing: Whenever the reader slows down at some word in the sentence, for example when a comma is attached to it (cf. Hill & Murray, 1997), the subsequent words appear to be read faster, in an almost linear fashion. A follow-up experiment, using sentences that were not ambiguous in any way, demonstrated that self-paced reading indeed gives rise to such an artefact. We will discuss the implications of these findings for our own research and for research in general.

Department of Linguistics, University of Nijmegen, Wundtlaan 1, NL-6525 XD Nijmegen, The Netherlands

[PI-17] Locus of context effects in sentence reading: Semantic effects on the initial eye landing position in words.

To investigate the locus of context effects in sentence reading, the present studies tested whether the position where the eyes initially land in a target word varies with the semantic relatedness between the target word and previously read prime(s). Results show a clear shifting towards the end of the target words of the initial eye landing position for related against unrelated target words. However, this effect holds only when the target word is of high frequency of occurence, and the last eye position before landing on the target word (or launch site) is close to the target word. These results are interpreted in favor of a context-dependent view of word processing, where context is supposed to affect very-early stages of word processing. On the other hand, the results obtained contradict the hypothesis that initial landing sites in words are purely determined by visual factors related to saccadic programming. These results are discussed in reference to the literature on eye movements in reading.

Frederic Lavigne-Tomps

Françoise Vitu

Géry d'Ydewalle

Laboratoire de Psychologie Expérimentale et Quantitative, Université de Nice, Sophia Antipolis, 24 Avenue des diables bleus, F-06300 Nice, France

[PI-18] The time course of semantic and syntactic encoding during language production estimated by ERP (event related potentials).

Bernadette Schmitt
Thomas F. Muente
Marta Kutas

The temporal processing of semantic and syntactic information encoding in language production was investigated by using ERP. Participants (native speakers of German) saw pictures and carried out a dual choice go/nogo decision based on semantic information (i.e., whether the picture shows an object or an animal) and syntactic information (i.e., whether the picture's name had masculine or feminine syntactic gender). We introduce the N200 (presumably related to response inhibition) as a tool to measure on-line language processing. The N200 indicated that semantic processing began earlier than syntactic processing. The results favor a serial or cascaded processing model of language production in contrast to a parallel processing account.

Department of Psychology, Neurocognition, Maastricht University, P.O. Box 616, NL-6200 MD Maastricht, The Netherlands

[PI-19] Alzheimer disease, task switching and the fractionation of working memory.

While the verbal and visuo-spatial subsystems of working memory are already fractionable into sub-components, analysis of the central executive is less advanced. This study follows on from earlier work in executive control in Alzheimer's Disease (AD) indicating a specific capacity to divide attention that is preserved in normal aging but impaired in AD. These separate measures test the possibility that the capacity for switching between tasks may be similarly differentially disrupted in AD. Groups of 36 AD patients, aged-matched control subjects and young subjects were tested on the Trails Test, forms A and B, on a verbal Trails task that does not require visual search, and on a simple arithmetic switching task. Results are consistent with the assumption of a specific switching deficit in AD but not normal aging.

Hilary Baddeley
Alan Baddeley
Romola Bucks
Gordon Wilcock

Department of Psychology, University of Bristol, 8 Woodland Road, Bristol BS8-1TN, United Kingdom

[PI-20] Solving simple mental arithmetic sums and products: Contribution of the central executive but not of the phonological loop.

Stijn De Rammelaere
Els Stuyven
André Vandierendonck

Research on the role of working memory in simple mental arithmetic revealed a crucial contribution of the central executive. However, contradictory results concerning the role of the phonological loop were obtained. For instance, Lemaire, Abdi and Fayol (1996) found an effect of articulatory suppression on the latencies of solving only true problems (e.g., $8 + 4 = 12$), whereas De Rammelaere, Stuyven and Vandierendonck (1999) reported no contribution of the phonological loop in any kind of problem. However, De Rammelaere et al. studied only a subset of all possible problems and investigated only one arithmetic operation. In two experiments, we investigated the role of working memory in solving all possible sums and products. The results were clear-cut and revealed (a) a crucial role of the central executive, and (b) no contribution of the phonological loop to the latencies of any kind of problem.

Department of Experimental Psychology, University of Gent, Henri Dunantlaan 2, B-9000 Gent, Belgium

[PI-21] Age-related strategy differences in task-switching.

Cognitive control in the elderly was studied in three experiments using the task-switching paradigm. The aim of these experiments was to study why older subjects experience large costs in performance when switching between tasks. Switch costs can be defined in two ways: (1) the difference between task alternations and task repetitions, and (2) the difference between task repetitions and single task performance. Manipulations of cue lexicality and stimulus integrality in Experiments 1 and 2 did not substantially affect task-switching behavior of the elderly. In Experiment 3 elderly subjects were forced to stress speed over accuracy. As a result, the difference between task repetitions and single task performance decreased to nearly zero. However, differences between task alternations and task repetitions remained, even when ample time was given for preparation (residual switch costs). These findings strongly suggest that different origins underlie the above mentioned definitions of switch costs. We assume that the remarkable decline in switch costs found in Experiment 3 was due to the abandonment of a conservative response criterion and the use of different strategies for different tasks. This can easily lead to an overestimation of age-related slowing.

Rena Eenshuistra
Eric-Jan Wagenmakers
Ritske De Jong

University of Amsterdam, Roetersstraat 15, NL-1018 WB Amsterdam, The Netherlands

[PI-22] Cognitive control, generation and evaluation skills and creative process.

Magdalena Groborz

The aim of the present study was to find out whether there is any relationship between psychometric creativity, generative and evaluative skills, and cognitive control. The study was based on three assumptions: (1) the attentional mechanism of cognitive control is responsible for division of its recourses into competing actions or mental processes; (2) creativity, generative and evaluative skills are related to stronger cognitive control; (3) creativity is related to the level of evaluative and generative skills. In the reported study, cognitive control was measured by means of typical interference tasks (Stroop, Navon). Creativity was assessed with Urban TCT-DP. Original method—GenEva—was designed to measure generative and evaluative skills. It appeared that there was a significant relationship between the level of creativity and generative skills, and the strength of cognitive control: subjects with a higher level of generative skills and a higher level of creativity demonstrated stronger cognitive control. Contrary to the taken assumption, creative subjects did not show any increased level of evaluative skills. According to the obtained results, it is hard either to accept or to reject the assumption no. 3. However, this data allow formulating several competing explanatory hypotheses concerning cognitive control and evaluative skills.

Institute of Psychology, Jagiellonian University, ul. Golebia 13, PL-31 007 Karakow, Poland

[PI-23] The relationships between spreading activation, cognitive inhibition and divergent thinking.

The present paper examines the relationship between divergent thinking and spreading activation in semantic memory (as manifested by the amount of semantic facilitation) and the relationship between divergent thinking and the attentional mechanism of cognitive inhibition (as manifested by susceptibility to negative priming and interference). The study is motivated by the paucity of experimental data concerning the relationship between higher cognitive processes and their basic cognitive components. Since Guilford's model of intellect structure, divergent thinking has been seen as a basis of creativity and problem solving. It is usually evaluated in three dimensions: fluency, flexibility and originality. We propose that the strength of mechanisms of activating memory units is the best to account for thinking fluency. Inhibitory processes are hypothesized to be responsible for the level of flexibility as well as originality of thinking. Divergent thinking subsets were stratified according to Guilford unusual consequences tasks. In addition, lexical and semantic decision tasks were administered in order to assess the amount of semantic facilitation. Computerized tests of interference-sensitivity and negative priming susceptibility were applied in order to assess distraction susceptibility and cognitive inhibition. Analysis of these data is in progress. The theoretical implications of this study will be discussed with reference to a hypothetical model of the cognitive basis of divergent thinking.

Aleksandra Gruszka

Institute of Psychology, Jagiellonian University, ul. Golebia 13, PL-31 007 Krakow, Poland

[PI-24] Age-related differences in the antisaccade task.

Sander Nieuwenhuis
K. Richard Ridderinkhof
Maurits van der Molen
Albert Kok

Reduced inhibitory efficiency and reduced executive control in general have been regarded as major determinants of cognitive aging. To further validate this claim, we performed two experiments to investigate age-related performance on an antisaccade task. The task required subjects to produce a saccade away from an abrupt onset, in order to respond accurately to a briefly presented target in the opposite location. Compared to a group of young adults (aged 18-25) the older adults (aged 59-80) showed more reflexive glances toward the abrupt onset and their saccadic reaction times of correct antisaccades were overproportionally slowed compared to correct saccades in a prosaccade task. By varying the SOA between abrupt onset and target, Experiment 1 also showed that older adults' correct antisaccades and corrective saccades after reflexive glances were often visually-guided by the target onset. Experiment 2 investigated whether this finding originated from strategic considerations or cognitive limitations. The results are discussed in terms of various models of cognitive aging.

Department of Psychology, University of Amsterdam, Roeterstraat 15, NL-1018 WB Amsterdam, The Netherlands

[PI-25] Beyond Sternberg's components: Sequential versus parallel processing in analogical reasoning.

Jaroslaw Orzechowski

Sternberg's (1977) model of analogical reasoning assumes the sequential nature of the cognitive process underlying analogy solution. Also, it does not take into account the individual parameters of memory and attention, which seem to influence both the process of analogical reasoning and the relation of this process to psychometric intelligence. Trying to avoid these faults, a new model of analogical reasoning is outlined, which introduces two formal parameters of the cognitive system's functioning: (1) parallel versus sequential information processing and (2) linear versus non-linear allocation of attentional resources. Three computerized tasks were used in the verification study. First, a non-verbal analogical reasoning task was constructed according to the dual-task paradigm. A series of nonverbal analogies (primary tasks) was accompanied by a simple psychomotor task, whose performance served as an index of the amount of attentional resources, which remained after feeding the primary tasks. Sequential or parallel mode of display of the task's elements, as well as the exposition time, were systematically manipulated. Second, a selective attention task was used in order to estimate the magnitude of one's attentional resource pool. Third, Saul Sternberg's task was applied to test one's working memory capacity.

Institute of Psychology, Jagiellonian University, ul. Golebia 13, PL-31 007 Krakow, Poland

[PI-26] Convergent task and divergent task and working memory. Measuring activity of central executive system by means of random generation of time intervals.

Krzysztof T. Piotrowski

Baddeley's Model of Working Memory distinguishes two subsystems: a) visuo-spatial sketch pad and b) phonological loop, and the superior one: Central Executive system. In the presented research, I was interested in the efficiency of CE, while solving convergent and divergent tasks. According to the premise that working memory has limited capacity, two hypotheses were tested: (1) CE will be more occupied by convergent tasks than by divergent ones, (2) CE will be less occupied in case of more intelligent individuals, regardless of the task condition. The report includes an experiment based on the dual-task experiment paradigm. The degree to which the CE was occupied was measured by means of a computer task: Random Generation of Time Intervals task. The task was designed especially for the purpose of this study and was based on Interval Tapping task by Vandierendonck. A parallel task to RGTI was either divergent or convergent task (both based on Raven Progressive Matrices). It appeared that while solving divergent tasks, Subjects indeed were tapping more randomly. Thus a conclusion can be drawn that convergent tasks engage more WM capacity than divergent ones. No direct relationship between intelligence and the degree of CE efficiency was found.

Institute of Psychology, Jagiellonian University, ul. Golebia 13, PL-31 007 Krakow, Poland

[PI-27] Response stopping during tonic inhibition.

The ability to stop a speeded motor response is examined using a stop signal paradigm in which the response to the reaction stimulus is countermanded by an occasionally and unpredictably presented stop stimulus. Horse race modeling allowed latency estimation of the internal stop response. Recent studies examined the nature of the stopping process by combining the stop signal paradigm with other paradigms that place a demand on the ability to inhibit. The current study adopted this strategy by comparing stopping during inhibition with control periods. 13 subjects were instructed to respond as quickly as possible with the right or left index finger after visual presentation of a letter (either a vowel A, U, E, O or a consonant R, S, V, Q). Responses on O and Q trials preceded by an X (nogo) should be omitted. A visual stop signal was presented on 15% of the trials. The proportion of stopping responses during inhibition periods was higher compared to control periods but stopping latencies were longer instead of shorter. These findings will be interpreted vis-à-vis recent studies on the nature of the stopping process.

Wery Van den Wildenberg

Maurits van der Molen

University of Amsterdam, Roetersstraat 15, NL-1018 WB Amsterdam, The Netherlands

[PI-28] Executive functioning and right-hemispherical dysfunctions in children with autism and Asperger's syndrome.

Sylvie Verté
Herbert Roeyers
Hilde Geurts

It is yet unclear to what extent so called 'high functioning' autism and Asperger's syndrome represent separate or overlapping conditions. There is some evidence of deficits on executive function tasks (EF-tasks) in children with autism across many studies, using a wide variety of measures. All studies found a significant difference between subjects with autism and control subjects on at least one EF-measure. In no study did the autistic group outperform the control sample on an EF-task. Furthermore, there is soms evidence that the Non Verbal Learning Disability (NLD)- profile can be seen as a neurocognitive model of Asperger's syndrome but not of autism, suggesting some overlap between the concepts of NLD and Asperger's syndrome. So initial findings suggest that there is a neuropsychological difference between the groups, but surprisingly only a few studies so far have been conducted that compared both groups with the same battery of tests. In this study we have taken a further look at the differences and similarities between 6 to 12 year old children with 'high functioning' autism (IQ $>$ 80) and children with Asperger's syndrome on a battery of well established EF-tasks and tasks supposed to measure right-hemispherical dysfunctions. Both groups were matched on chronological age and overall IQ. Initial results suggest that it might be possible to make an empirical distinction between Asperger's syndrome and autism based on their neurocognitive profiles.

University of Gent, Henri Dunantlaan 2, B-9000 Gent, Belgium

[PI-29] Effect of emotional state on executive control in working memory.

Two experiments examined the efficiency of executive processes in anxious and control subjects. In the first experiment, lists of 4 or 5 consonants were presented sequentially and subjects had to recall lists in serial, reverse or alphabetic order. The effects of three factors were examined: emotional state (normal vs anxious); memory span (4 vs 5) and recall condition (serial vs reverse vs alphabetic). We measured response latencies that account for the time needed to manipulate consonants, number of recalled consonants and number of correct serial positions that account for the manipulation efficacy. The results show a significant decay of correct serial positions in the anxious subjects when order manipulation is required. In the second experiment, effect of emotional state was tested in a longer span condition (6 consonants). We tested the difficulty to manipulate consonants when they were more or less distant according to the alphabetic order. Anxious subjects show shorter latencies than normal subjects whatever the recall condition and recall less consonants when alphabetic distance is short. Furthermore, a significant interaction is observed between emotional state and alphabetic distance for manipulation efficacy rates. These data suggest that emotional state change capacity to keep and manipulate items in working memory. They raise questions about interference of manipulation on the retention of consonants.

Sandrine Vieillard
Jean-Claude Bougeant

Laboratoire de Psychologie Cognitive, Université Lumière Lyon 2, 5 avenue Pierre Mendès-France, F-69676 Bron Cedex, France

[PI-30] Speeded performance and the control of action: A study of individual differences.

François Vigneau
Bruno Dauvier
Jacques Juhel

Various kinds of factors have been hypothesised to account for individual differences in speeded performance, e.g., attention, speed of information processing, task-related knowledge, and so forth. Most models include such factors in the context of a resource-limited cognitive system, stressing the role of these factors in dealing with the limitations. A different approach is to consider variability in cognitive control factors, such as task definition, setting of response criteria, task regulation, and monitoring of performance. The experiment we report consists of 30 subjects completing two versions of a Posner-type name-identity letter matching task. In the first condition, subjects have control over the duration of the inter-trial intervals (ITIs), while a typical fixed-pace presentation of items is used in the second condition. A total of 480 items (or 6 blocks) are completed in each condition, allowing for analyses of the reduction of latency and intraindividual variability of RTs as well as of ITIs. Individual differences in RTs are related to individual differences cognitive measures. The results are discussed in terms of individual variability in adjusting to repetition of the task, errors, and time constraints.

Laboratoire de Psychologie Expérimentale, Université de Haute Bretagne (Rennes II), 6 avenue Gaston-Berger, F-35043 Rennes Cedex, France

[PI-31] Task-switching: Proactive inhibition of competitive task-sets.

A basic finding in research on executive functions is that alternating between two tasks is more difficult than repeating a task. This so-called task-shift cost is believed to reflect additional processing demands on 'executive functions' to reconfigure the cognitive system. Interestingly, it seems to be harder to switch to the dominant member of a pair of tasks. In this connection it is argued that the behavioral costs of switching between tasks result from involuntarily remaining components of the task-set for the preceding task; the asymmetry arises because an 'inhibition' of the dominant task is implemented for the execution of the non-dominant task, leading to a pronounced interference in the upcoming task. We show that indeed control problems associated with the preceding task are crucial for the occurrence of task-shift costs. Using color-word Stroop stimuli and the alternating-runs paradigm, we find that asymmetrical shifting costs do not occur unless the set of the preceding task is triggered by an incongruent stimulus. This indicates that it is proactive inhibition of the dominant task set during the execution of the preceding (non-dominant) task that produces the asymmetry and that this inhibition only takes effect if the triggering stimulus gives rise to conflicting responses.

Florian Waszak

Bernhard Hommel

Max Planck Institute for Psychological Research, Leopoldstraße 24, D-80802 Munich, Germany

[PI-32] Response competition in a simple response task.

Marcel Brass
Harold Bekkering

In a series of experiments the conditions for compatibility effects in a simple response task were investigated. In Experiment 1, a pre-instructed finger movement (in one block a tapping movement of the index finger and in the other block a lifting movement), had to be executed in response to a compatible or incompatible finger movement presented on a computer screen. A pronounced reaction time advantage was found for compatible compared to incompatible trials. The second experiment showed that physical restriction of the execution of the second response alternative, i.e. the finger was constrained from lifting or tapping, reduces the size of the compatibility effect even though the constrained response alternative was not task relevant. In the third experiment it was demonstrated that blocking the stimuli, i.e. all stimuli presented were lifting movements in one block and tapping movements in the other block, also leads to a reduction of the compatibility effect. All together, the results demonstrate that two response alternatives have to be active for a compatibility effect to occur. This response activation process can be established by executing the response alternatives or by observing the alternatives.

Max Planck Institute for Psychological Research, Leopoldstraße 24, D-80802 Munich, Germany

[PI-33] Does a central inhibitory mechanism operate through action-effect inhibition?

Logan and colleagues have argued for the existence of an independent inhibitory mechanism to account for behavior in a stop-signal paradigm (Logan, 1994). De Jong, Coles and Logan (1995) showed that response inhibition can be accomplished in two ways: i) by shutting down a peripheral go-signal, which results in fast but overall stopping of all motor-signals; or ii) by preventing outflow of a central motor command, resulting in slower but more selective motor inhibition. It was reasoned that a central inhibitory process should operate on action-effects, as they have been called the building blocks of intentional movement production (Hommel, 1996). To test this hypothesis an experiment was run in which we presented participants a dual-task situation, with as Task 1 a Go/Nogo task and as Task 2 a perceptual identification task. To differentiate between peripheral and central inhibitory mechanisms, Task 1 was adjusted in a second experiment so that a fixed alternative response needed to be given on Nogo trials. The results are discussed in terms of inhibition mechanisms in perceptual-motor control and implications for the action-concept theory are highlighted.

Bernie Caessens

Department of Experimental Psychology, University of Gent, Henri Dunantlaan 2, B-9000 Gent, Belgium

[PI-34] The influence of acoustic feedback on bimanual tapping.

Knut Drewing
Frank Miedreich
Gisa Aschersleben

In a repetitive tapping task intertap interval variability was reduced when subjects tapped with two hands in contrast to single-handed tapping (Helmuth & Ivry, 1996). In a decomposition of total variability into central timing and motor components (according to Wing & Kristofferson, 1973) the bimanual advantage could be attributed to the timing variability. Helmuth and Ivry proposed separate timers for each effector, which outputs are integrated before the movements are implemented. Alternatively, the timing of movements could be based on their sensory consequences and the bimanual advantage explained by augmentation in sensory signal. The bimanual advantage was shown in the continuation paradigm, in which subjects first synchronize their movements with a metronome and then continue without a pacing signal. In a first experiment we could replicate the finding. In a second experiment, we studied the influence of sensory movement consequences. Central timing variability was reduced by adding acoustic feedback to each tap. This could be shown for uni- and for bimanual tapping, so that timing variability decreased systematically with increasing sensory consequences. These results give support to the alternative view that bimanual advantage is caused by the augmentation of sensory consequences and conversely, are not easily integrated into the concept of Helmuth and Ivry.

Max Planck Institute for Psychological Research, Leopoldstraße 24, D-80802 München, Germany

[PI-35] The power of strategic processes in action-planning.

While examining the temporal characteristics of the action-planning process within a dual-task paradigm we found that the planning of a delayed action depended on the different SOA sets used. In one experiment the SOA's ranged from 1100ms to 2000ms. Here participants did plan the to be delayed action, contrary to the situation where the SOA's ranged from 100ms to 1000ms. This is to be expected at very short SOA's where planning the action is nearly impossible, but not at long SOA's where there should be enough time to completely plan and prepare the action. We argued that the use of very short SOA's together with long ones in one set, dissuaded participants from planning the action altogether. This kind of strategic decisions is common in dual-task situations where participants allocate their resources to the task they expect to be the first or most important. To test this idea we no longer used SOA as a within-subjects variable but manipulated it between conditions. We expected no action-planning at short SOA's and a firm action-planning effect at long ones.

Mandy Ghyselinck

Department of Experimental Psychology, University of Gent, Henri Dunantlaan 2, B-9000 Gent, Belgium

[PI-36] Priming and motor imagery.

Anne Louvegnez
Olivier Koenig

Converging evidence indicates that the preparation of an action facilitates the semantic processing of functional information about objects. The aim of the present study was to explore the hypothesis that motor imagery, which shares processes with motor preparation, facilitates semantic processing about functional information of objects. Forty-eight right-handed subjects participated to a priming experiment consisting of separate study and test phases. In the study phase, they were presented with objects that could be used to perform an action. Three different study phases were proposed to 16 subjects each. In a perceptual study phase, subjects were instructed to just look at the objects. In an internal motor imagery study phase, they were instructed to imagine themselves performing an action with the objects. In an external motor imagery study phase, they were instructed to imagine someone else performing an action with the objects. Then, all subjects performed a lexical decision task with verbs and pseudo-verbs. We predicted a facilitation for verbs that corresponded to the actions suggested by the objects of the study phases.The analysis of response times revealed that subjects responded faster for words that corresponded to actions of the study phase. However, this result was observed when subjects just looked at the objects, and not when they imagined actions.

Cognitive Psychology Laboratory, University Lyon 2, 5 avenue Pierre Mendès-France, F-69676 Bron, France

[PI-37] A neuromagnetic view on the role of modality in sensorimotor synchronization.

When subjects are asked to synchronize finger-taps with an isochronous, auditory metronome they exhibit a rather reliable anticipatory error of about 20-60 ms. The so-called "Code-Generation-hypothesis" suggests that this anticipatory error reflects differences in conduction times in the involved sensory pathways. One of the main assumptions is coincidence of representations of the different sensory inputs. To get information about the central processing associated with this task, neuromagnetic studies with variation of the pacing modality were conducted. Eight participants had to tap with their right index finger in synchrony with an isochronous binaural click or a tactile stimulus that was applicated either at the left index finger or at the left big toe. Analysis of behavioral data shows that during tactile pacing the anticipatory error disappears in the hand as well as in the foot condition. Source analysis of evoked responses results in three sources mainly active at different points of time. Whereas during auditory pacing these three sources are located in contralateral primary sensorimotor cortex, during tactile pacing the third of these sources is located in contralateral inferior posterior parietal cortex with identical temporal course compared to the auditory condition. These results indicate the modality-dependency of anticipatory error as well as the crucial role of the modality-dependent source in mediating between an externally given isochronous signal (perception) and motor activation (action).

Katharina Müller
Gisa Aschersleben
Frank Schmitz
Alfons Schnitzler
Hans-Joachim Freund
Wolfgang Prinz

Max Planck Institute of Psychological Research, c/o Department of Neurology, MEG-Lab, Moorenstrasse 5, D-40225 Düsseldorf, Germany

[PI-38] Capacity of working memory: Is the visuo-spatial sketchpad more automatic than the phonological loop?

France Aumont
Christophe Boujon

Baddeley (1986) postulated a structural approach in his model of Working Memory (WM). In contrast, Engle (Conway & Engle, 1996; Rosen & Engle, 1994; Turner & Engle, 1989) proposed a functional approach of WM. The capacity would depend on quantity of an available activation. Dissociation of automatic vs controlled processes in WM could be reflected by individual differences in limited-capacity attentional resources. In this study, participants were placed into one of two groups based on their performance into lower span (LS) or upper span (HS). Half of the subjects in each group received either a verbal or a visuo-spatial task. Each one consisted of two successive versions: simple memory-span task and memory-span task with suppression. The main effect of groups confirmed superiority of HS on LS performances (Rosen & Engle, 1997) in spite of a greater sensitivity of HS to difficulty of task. Thus, the capacity of HS would be more based on controlled processes than LS one. Finally, interaction between type of version and groups indicated that LS recalled more items in the verbal task than HS, and conversly in the visuo-spatial task. These results suggest that the visuo-spatial sketchpad is a more automatic process than the phonological loop.

Laboratoire de Psychologie de la Cognition, de l'Involution et du Développement, Université D'Angers, 11 Boulevard Lavoisier, F-49045 Angers cedex, France

[PI-40] A word span test for Italian children.

Studies concerning evaluation of phonological working memory have shown the important relationship of this cognitive function with linguistic skills, such as vocabulary acquisition, development of reading and comprehension and second language learning. The Word Span Test is a valid instrument for evaluating phonological working memory. The aim of this research was to create a Word Span Test for Italian children and to evaluate its developmental pattern. For this reason, a corpus of 20 high frequency animal names was prepared (10 two-syllable and 10 three-syllable ones). On each trial, the experimenter spoke aloud a sequence of animal names. The child was instructed to attempt to repeat the list immediately, in the correct order. There were three trials for each list length. Span was scored as the maximum length at which the child correctly recalled at least two trials out of three. When the child correctly recalled only one of the trials in the next list length, a bonus of 0.5 was given. Italian children from three to ten years old, were evaluated on this task. Results were analyzed by Anova and post-hoc comparisons between the means, in order to investigate a continuity/discontinuity pattern during development.

Laura Ciccarelli
Lisa Arduino
Marica De Vincenzi
Remo Job
Maria D'Alessio
Valeria Schimmenti

Department of Psychology, University of Padova, Via Venezia 8, I-35131 Padova, Italy

[PI-41] Working memory and language comprehension in mentally retarded adolescents.

Myriam Moleux
Marie-France Ehrlich

Laboratoire de Psychologie Cognitive de la Communication, Université René Descartes, EPHE and CNRS, 28 rue Serpente, F-75006 Paris, France

In a previous study (Moleux, Seigneuric & Ehrlich, 1998) we analysed the structure of relations between vocabulary, decoding, phonological memory, verbal working memory and reading comprehension in retarded adolescents and nonretarded children. In retarded, verbal working memory was the most powerful direct contributor (43%) to comprehension. The direct contribution of phonological memory was lower (20%). In nonretarded, the direct contribution of phonological memory was strong (37%) but verbal working memory did not contribute significantly. The present study aimed at examining two points: 1) Specify the nature of working memory resources involved in reading comprehension. Are they specialised for language processing or general? 2) Analyse how working memory capacity constrains comprehension processes by studying its role in pronoun resolution. 48 mildly retarded adolescents (mean IQ = 59, mean CA = 17 years) and 48 non-retarded children (mean CA = 9 years) participated to the study. Subjects were submitted to the following tests: A reading comprehension test, a pronoun resolution test in which two variables were manipulated (distance antecedent-pronoun and ambiguity of pronoun), two tests measuring spatial and verbal WM capacity, a non-word repetition test measuring the phonological memory capacity. The main results were as follows: 1) In retarded and non-retarded, patterns of correlation between verbal WM, spatial WM and both comprehension tests suggested that WM resources involved in comprehension are specialised for language processing. 2) The performances of two subgroups with high and low WM capacity were compared. In retarded and non-retarded, high WM were better than low WM in pronoun resolution.

[PI-42] Activation and working memory in children.

Catherine Monnier
Jean-Luc Roulin

Some authors define Working Memory (WM) as the part of long term memory that is temporarily active above a critical threshold (e.g., Cowan, 1988). In these models, the total amount of activation is thought to be limited and this limit represents WM capacity. It is also assumed that WM is a single unitary resource (general capacity model of WM): a single WM capacity is implicated whenever information must be temporarily maintained (e.g., Engle, Cantor & Carullo, 1992). Like Cantor and Engle (1993), we use the fan-effect procedure to test these two assumptions with children (8–9 and 10–11 years old) and adults. In order to evaluate WM capacity, two WM tasks are proposed: a verbal and an equivalent spatial running span tasks. The performance on these two tasks will allow us to contrast two groups of subjects at each age level: the High Span (HS) versus the Low Span subjects (LS). Then, each group will be submitted to the classical fan manipulation (Anderson, 1983). With children and adults, we expect a greater fan effect for the LS than for the HS subjects (see Cantor & Engle, 1993). Furthermore, if the general capacity model is correct, the verbal and the spatial running tasks should lead to the same pattern of results concerning the magnitude of the fan effect in the different groups.

Université Paul Valéry, Route de Mende, F-34199 Montpellier Cedex 5, France

[PI-43] Skilled performance in soccer: Hypothesis of long-term working memory.

Virginie Postal
Pascal Castano
André Charles

To account for the exceptional performance of experts, Chase and Ericsson (1981, 1982) have developed the theory of skilled memory based on a temporary storage of the information. More recently, Ericsson and Kintsch (1995) have suggested that another mechanism could explain the superiority of expert memory: the Long-Term Working Memory. The data found by Vicente and Wang (1998) did not support this hypothesis. The authors preferred one explanation in terms of constraint attenuation. In our study, we have attempted to show that these two propositions are not conflicting. We administered a new computerised version of the Reading Span test of Daneman and Carpenter (1980) to subjects who were novices or experts in soccer. In opposition to the original version, the different words at the end of each sentence have an inter-item organisation that can be perceived only by the experts. Different variables are also manipulated such as practice duration, passive or active learning (supporters, players, trainers), authentic vs. randomised version. In order to statue in favour of a mixed theory between Ericsson and Kintsch (1995) and Vicente and Wang (1998) theories, we have measured the processing time, the number of words correctly recalled.

Laboratoire de Psychologie: Equipe de Psychologie Expérimentale, Université Victor Segalen Bordeaux 2, 3 place de la Victoire, bat H, F-33076 Bordeaux Cedex, France

[PI-44] Learning new names for new stimuli: Making the connection.

Most studies on lexical acquisition treat conceptual and phonological aspects of the acquisition as two different separated problems. We aimed to test the ability of 5 years-old children to associate new names with unknown shapes. Two sets of 4 drawings were used: 1] one set of highly distinctive shapes and 2] one set of less distinctive shapes. Children had to learn the name (a bisyllabic nonword) of each shape. Our hypothesis was that the structure of the stimuli (highly or less distinctive) would influence phonological encoding in the sense that children would produce more phonological errors when stimuli are less distinctive. Our (learning) association task was similar to the one proposed by Baddeley and collaborators to young children. They found that children who have the higher phonological short-term memory span also learn the association between an "unreal" object and a nonword faster. A second purpose of the experiment was to assess the relationships between short-term memory span and the number of phonological errors in the learning task. Our data indicate that there is no strong correlation between the ability to encode new names (in terms of their phonology) and phonological short-term memory.

Jean-Pierre Thibaut

Annick Comblain

Faculty of Psychology, University of Liège, 5, boulevard du Rectorat, Bat 32, B-4000 Liège, Belgium

[PI-45] Heterogeneous patterns of cognitive impairments in schizophrenic patients producing confabulation.

Saskia Dab
E. Lilet
C. Frith

The aim of the study was to test hypotheses proposed by Nathaniel-James and Frith (1996) and Nathaniel-James et al. (1996) to account for the occurrence of confabulation in schizophrenic patients. More precisely, we investigated encoding and retrieval processes, memory verification abilities and verbal comprehension. Five patients were tested. Four were considered confabulators according to the abnormal proportion of errors they produced in fables and story recall tests. The pattern of results obtained by the four confabulator patients was heterogeneous. Two of them exhibited a retrieval impairment with preserved encoding abilities: normal recognition and normal cued recall, with a deficit in free recall tests. Within the retrieval processes, the monitoring component was preserved and the difficulty was restricted to the search component (i.e., early stage impairment). These results do not support the hypotheses proposed previously in the literature and suggest that a monitoring deficit is not a necessary condition for confabulation to occur. On comprehension tests, all patients had normal results on a classical neuropsychological test (Token Test) and on the morale choice of the fable, but had difficulty on a true/false test about statements related to the fables. The particular pattern of results that the four patients obtained is discussed both in terms of the artificial boundary between encoding (memory domain) and verbal comprehension (language domain) and in terms of the ineffectual attempt to find a unique deficit for confabulation, as suggested by recent theories (Burgess & Shallice, 1996; Moscovitch & Melo, 1997).

Laboratoire de Psychologie Expérimentale, Université Libre de Bruxelles, Avenue F. D. Roosevelt 50, CP 191, B-1050 Bruxelles, Belgium

[PI-46] Research of processes involved in directed forgetting, method item by item, at young and old adults through a manipulation of processing.

In the directed forgetting paradigm, typically subjects have to forget a part of the information previously encoded or that appears irrelevant. In the method item, each item is cued to be forgotten (F-item) or to be remembered (R-item). Two hypotheses are matched to explain mechanisms invoked in this procedure. On the one hand a hypothesis emphasizes a differential rehearsal and differential grouping of R-items and on the other hand, a hypothesis involving a retrieval inhibition of F-items. There is evidence that inhibitory processes become deficient with age. We tested these hypotheses through a young and old adults study. Different subjects performed orienting tasks (control, phonologic or semantic) on each item before to receive its cue, then they were asked to recall either R-words or F-words. Results indicated that depth of processing acts identically on the two types of items whatever age. However, results showed that R-items were more accessible than F-items. Neither mechanism cited above was sufficient to account for these results, consequently it seemed relevant to introduce the selective research theory. Indeed, this theory postulates that R- and F-items are stored in the same way, but recovery is made preferentially on R-items.

Katy Gauthier

Brigitte Le Boued

Laboratoire de Psychologie Cognitive, UFR Lettres, Langues et Sciences Humaines, CID UPRES EA 2646, 11 boulevard Lavoisier, F-49100 Angers, France

[PI-47] Interference in implicit memory due to processing interpolated material.

Sander Martens
Gezinus Wolters

This paper addresses the susceptibility of implicit memory to interference from interpolated material. Implicit memory is measured using word stem completion tests. Interference is manipulated by presenting interpolated lists consisting of words that do or do not have beginning word stems in common with previously studied target words (e.g., target word PARagraph followed either by interpolated words like PARadise or VICinity). Experiment 1 showed interfering effects on both implicit and explicit recollection of target words when words in the interpolated lists had similar beginning word stems. Increasing the number of interpolated words with corresponding word stems (e.g., not only PARadise, but also PARking, PARdon and PARliament) produced an increasing amount of interference. In a second experiment, the effects of Level of Processing on the obtained interference in implicit and explicit memory were studied. Interpolated lists of words were presented in a shallow or deep processing task. It was predicted that the level of processing (shallow or deep) will not affect interference in implicit memory. In contrast, explicit memory performance would be affected by interpolated words presented in a deep but not a shallow processing task.The findings support models suggesting that interference in implicit memory is a pure response competition phenomenon caused by the simultaneous priming of both target and competing responses. Amount of interference can be explained by the relative strengths of competing responses.

Unit of Experimental and Theoretical Psychology, Leiden University, P.O.Box 9555, NL-2300 RB Leiden, The Netherlands

[PI-48] Age-related effects on hypermnesia.

Age-related effects on hypermnesia were investigated in two experiments. Old and young adults studied a list of pictures and then received multiple recall tests. Hypermnesia, an increase in performance over tests, was observed for young but not for old adults. Analysis of recall components showed that whereas reminiscence was similar for old and young subjects, inter-test forgetting was much higher in the older group. The results are explained in terms of age-differences in relational and item-specific processing. Since item-specific processing tasks have been shown to increase the probability of reminiscence, whereas relational-processing tasks have been shown to reduce inter-test forgetting, the results support the notion that it is primarily spontaneous relational encoding that is deficient in older adults.

Ulrich Olofsson
Nobuo Ohta

Department of Psychology and Education, Linköping University, S-581 83 Linköping, Sweden

[PI-49] Cross-modal transfer in artificial grammar learning.

Yael Poznanski
Joseph Tzelgov

In the artificial grammar learning paradigm, the learning phase is frequently followed by a legality decision task. In this task, the participants are presented with new strings, not included in the learning phase, and they have to decide which of them are legal. In our experiments, the old strings, included in the learning phase were also included in the test phase in order to prevent memory of interfering with the effect of legality decision. The existence of a transfer is usually considered as a proof of abstract knowledge, since participants can transfer their knowledge from one set of symbols to another one. Redington and Chater (1996) argued against this claim for three main reasons: (1) the lack of well-defined control groups, (2) the findings that there can be transfer of exemplar learning as well, and (3) a learning effect happening during the test phase itself. In this experiment we tried to take into consideration all aspects of this criticism, in order to show cross-modal transfer of knowledge in artificial grammar learning. The participants, divided into three groups, either learned strings formed by letters or unknown symbols or didn't learn at all, but were tested on both. The results indicated no reliable transfer of knowledge.

Department of Behavioral Sciences, Ben Gurion University of the Neev, Beer-Sheva, Israel

[PI-50] Working memory processes in abductive reasoning.

Abduction is the process of finding a best explanation for a given set of data. Diagnosis, scientific discovery or text comprehension can all be regarded as examples of abductive reasoning. Characteristic for these is the sequential nature of this process. To find an explanation it is necessary to hold some of the presented data and a representation of the situation in memory. Studies of text comprehension show that the exact wording of a phrase is only as long available in working memory as it is not comprehended yet. Thereafter the meaning is stored in some structure in LTM. The same may hold for abductive reasoning, when an explanation is sought for some data. In a first experiment we examined whether unexplained data are more readily available during abductive reasoning than explained data. Subjects were sequentially presented with some observations they had to explain. On some point during the data presentation the subjects were shown a datum they had to recognize as old or new, respectively. The results show that the reaction times increase and the accuracy decreases for unexplained data with the number of intervening observations between presentation and recognition. For explained data no such change was observed. We interpret this in the light of the model of human abductive reasoning by Johnson, Krems and Amra (1994).

Martin Baumann
Josef F. Krems

Department of Psychology, University of Technology Chemnitz, D-09107 Chemnitz, Germany

[PI-51] Predictive and diagnostic learning: Is one more fundamental than the other?

Marc Buehner

People's reported failures to distinguish diagnostic from predictive conditional probabilities is often cited as evidence for a predilection of causal schemas in conditional reasoning (e.g., Tversky & Kahnemann, 1980). We investigated how predictive and diagnostic reasoning abilities are influenced by context and learning direction. Participants studied the relations between two alternative causes (c1 and c2) and one effect (e) in a sequential learning paradigm. The task was structured such that c1 always produced e, c2 produced e 50% of the time, and $\Pr(e|c1) > \Pr(e|c2)$ but $\Pr(c1|e) < \Pr(c2|e)$. Cover stories provided predictive, diagnostic, or neutral contexts. We also manipulated direction of learning (cause to effect versus effect to cause) and task demands (passive attending versus trial-by-trial predictions). Dependent measures were participants' predictive and diagnostic judgments. Context did not influence participants' predictive or diagnostic judgments, but learning direction and task demands led participants to deviate from normative judgments: predictive judgments were biased when learning was diagnostic, especially under the higher task demand of making predictions. Diagnostic judgments were largely unaffected by all three factors. We speculate that biases in conditional reasoning are determined by attentional focus on predictive or diagnostic aspects of the causal structure during learning.

Department of Psychology, University of Sheffield, Sheffield S10 2TP, United Kingdom

[PI-52] Logtest: A tool for evaluation and learning of the use of logical connectives in sentences.

Numerous cognitive activities in human beings are supported by formal resources. For this aim, we have developed Logtest, which is an evaluation and learning tool directed to normal and impaired children in order to test their skill in manipulation of logical information. Besides presenting Logtest and several copies already prepared to evaluate and to teach the use of classical boolean connectives (negation, conjunction, disjunction, implication and equivalence), we also present a pilot research about the knowledge acquired by 12 year old children distributed in two groups (normal children and impaired children). The diverse items presented offer several levels of abstraction, from simple evaluation of sentences as true or false to the comparison of sentences with designs of animals to make the task easier. Our results confirm the differences between both populations, normal and impaired children, when they use the connectives in several contexts: normal speech, reading, school work, etc.

Alfredo Burrieza
Santiago Torres
Gonzalo Ramos
Isabel Márquez

Area de Logica y Filosofma de la Ciencia, Universidad de Málaga, Campus de Teatinos, E-29071 Málaga, Spain

[PI-53] Initial belief state as predictor of belief revision.

Kristien Dieussaert
Walter Schaeken
Wim De Neys
Géry d'Ydewalle

Nonmonotonic reasoning (i.e., a former conclusion doesn't necessarily hold when new information is added) is extensively investigated by Artificial Intelligence researchers, but was neglected in psychology. Recently, the topic has gained the interest of deductive reasoning researchers (a.o., Rips, 1994; Johnson-Laird, 1993). We repeated the experiments on belief revision done by Elio and Pelletier (1997) with an important modification, id est we manipulated the initial certitude level of the conditional rule. Contrary to their findings, our results don't show that conditional sentences (rules) were more readily abandoned when contradictory information was added than ground sentences (facts) in order to recreate a consistent belief state. Refinements in the design lead to the conclusion that the more certitude about the conditional was created, the less prepared participants were to reject the conditional rule and the more resistent their belief in the rule was afterwards. These findings are in line with the model of Holyoak, Koh and Nisbett (1989), initially developed as an inductive reasoning model. They propose a 'default hierarchical system' of conditional rules. The presented studies are rather explorative in nature and need further elaboration in order to model the factors that play a role in belief revision.

Laboratory for Experimental Psychology, University of Leuven, Tiensestraat 102, B-3000 Leuven, Belgium

[PI-54] Individual differences in three reasoning tasks.

The present study investigated individual differences in three abstract deductive tasks, Wason Selection Task, Rule Discovery Task, and a discrimination learning task. Only recently has the area of individual differences been concerned with studying a range of tasks. Stanovich and West (1998a, 1998b) reported a significant correlation between competence and performance across a battery of inductive, deductive, and probablistic tasks. The identification of cognitive styles or strategies is of importance within reasoning because of its implications concerning general theories of reasoning (Roberts, 1993). One of the main objectives of the present experiment was to establish a relation between the three tasks on an empirical level (theories have previously stated the relations logistically between the tasks). The types of strategies individuals used to solve the tasks were classed as either elimination/enumeration which were found to be consistent across all three tasks, consistencies in level of performance of each participant were also observed. The results revealed highly significant correlations both in performance, and strategy used.

Magda Osman

Human Sciences, Brunel University, Room A31, Saltash Accomodation, Uxbridge Middlesex UB8 3PH, United Kingdom

[PI-55] Strategies in reasoning and production task.

Jean-Baptiste van der Henst

Philip N. Johnson-Laird

The first aim of this study was to shed light on the strategies that individuals use when they reason and to draw a typology of these strategies. A "strategy" is the sequence of steps that an individual follows in drawing a conclusion. We carried out an experiment in which 24 participants had to solve 12 three-premise problems based on sentential connectives. They could use paper and pencil and they had to "think aloud" while we video-recorded their protocols. The second aim of our study was to investigate the influence of different strategies on the conclusions that the participants drew. Consequently, for each problem, the participants had to express their own conclusions. The results showed that participants used different strategies. We distinguished two main categories: the 'model' strategy and the 'verbal' strategy. The model strategy consists in representing graphically a set of possibilities compatible with the premises. The verbal strategy consists in rephrasing one or more premises in terms of conditional assertions. About 35% of the problems were solved with a model strategy and 63% with a verbal one (the remaining 2% were unclassifiable). The influence of strategies on the participants' conclusions was clear. When a categorical conclusion was impossible, 59% of conclusions based on the model strategy were disjunctive in form, whereas 85% of conclusions based on the verbal strategy were conditional in form.

Princeton University, Green Hall, O8540 Princeton NJ, USA

[PI-56] Implicit affirmation and denial in conditional reasoning with negations.

Conditional inference problems set up with implicit affirmation or denial (A affirms no B, A denies B) are harder to solve than problems constructed with explicit affirmation and denial (A affirms A, no B denies B). The three experiments we report corroborate this prediction. In Experiment 1 we used letters as lexical content. Here the presence of a negation cannot be controlled with implicit formulations as it is done with explicit formulations. We present two other experiments, in which the presence of a negation is systematically manipulated using classes and their instances. In Experiment 2 we used a binary class as lexical content (A affirms vowel, A denies no vowel). The effect of an implicit link weakens. In Experiment 3 we used a multiple class content and a binary content. We conclude that the effects of implicit versus explicit affirmation or denial can be explained by the translation processes needed in case of mismatching premises. With explicit forms the content of the premises match, no translation is necessary. The content of the premises of implicit forms mismatch and need to be translated: The translation is relatively easy with a binary class content, while with a multiple class content this translation demands more effort.

Nikola Verschueren
Walter Schroyens
Walter Schaeken
Géry d'Ydewalle

Laboratorium voor Experimentele Psychologie, Katholieke Universiteit Leuven, Tiensestraat 102, B-3000 Leuven, Belgium

[PI-57] Reasons for acting in counterfactual thinking.

Clare R. Walsh
Ruth M. J. Byrne

People frequently construct counterfactuals, that is, alternatives to reality, by undoing controllable events (Girotto, Legrenzi & Rizzo, 1991). We carried out two experiments to investigate whether actions would be less mutable when the protagonist's reason for acting was given. In the first experiment, the reason was an event which initiated the intention to act. Participants generated counterfactuals and made causal judgements in response to a scenario with or without this reason. The results showed that presenting a reason for an action reduced the mutability of the action and increased the frequency with which blame was assigned to a second party. In the second experiment, the reasons examined were the protagonist's desire to act or his purpose for acting. Participants mutated the action less often when it was presented with a purpose than either a desire or no reason. We discuss the implications of our findings for counterfactual thinking and for the way that people evaluate their actions.

Department of Psychology, University of Dublin, Trinity College, Dublin 2, Ireland

[PI-58] Hyperactive behaviour in children with Attention Deficit Hyperactivity Disorder (ADHD) explained by the delay aversion hypothesis.

It has been suggested that the behaviour of children with ADHD may mainly be motivated by an attempt to avoid delay. In previous studies, this hypothesis has been confirmed concerning impulsivity. It has been suggested that inattention and hyperactivity could also be related to this delay aversion. In the present study, the effect of delay aversion on hyperactivity in children with ADHD was examined. It was hypothesised that, when confronted with a delay that can not be altered, children with ADHD would show hyperactive behaviour as an attempt to change the experience of the delay. Thirty hyperactive and 30 non-hyperactive children were confronted with a delay. In one condition no extra stimulation was given, in another condition non-temporal stimulation was provided. It was hypothesised that children with ADHD would profit more from the extra non-temporal stimulation. The results show that, although both groups are to some extent delay averse, this delay aversion is stronger for children with ADHD for movements of trunk, touching objects and self-talk. According to these data the delay aversion hypothesis is a possible explanation for hyperactivity in children with ADHD. However, it needs to be defined more specifically with regard to different target behaviours.

Inge Antrop

Herbert Roeyers

University of Gent, Henri Dunantlaan 2, B-9000 Gent, Belgium

[PI-59] Nonlinear dynamics of temporal control in children.

Céline Clément
Jean-Claude Darcheville

The scallop pattern observed in fixed-interval schedules (FI) in animals is highly variable. The nonlinear dynamical system developed by Hoyert (1992) is able to generate this variability and is more successful than any other to account for within-interval and between-interval variability in pigeons. Eight children (mean age 4 years and 11 months) were trained on fixed-interval schedules (FI10s, FI20s, FI40s). The operant response was touching an illuminated location on a touch-sensitive screen, and 20s of cartoon was the reinforcer (same procedure as Darcheville et al., 1992). Children's data were analysed using nonlinear dynamics methods proposed by Hoyert (1992). Return maps are highly ordered. It means that the observed variability is inherent in the system. Moreover, one may note the multistability of the attractor: behaviour is stable within-subjects, between-subjects, and between various FI conditions. The multistability is a characteristic of biological systems (Thelen & Smith, 1994).

Equipe URECA—UFR de Psychologie, Université Charles de Gaulle—Lille 3, Pont de Bois, BP 149, F-59653 Villeneuve d'Ascq Cedex, France

[PI-60] Time estimation of temporally structured auditory events.

Rosalia Di Matteo

Marta Olivetti Belardinelli

In this study an attempt was made to investigate some of the complex interactions among factors affecting time estimation of temporally structured auditory events, and the emphasis was set on the temporal organization of events to be judged (Jones & Boltz, 1989). According to a general contextualistic framework proposed by Block (1990), time experience depends on four related factors: individual characteristics (sex, personality, interests, temporal perspective and previous experiences); content of time period (internal attributes of time events, such as number of units, modality, duration, temporal structure); activities during a time period (active or passive attending strategies for acquiring and coding information) and time related behaviours (environmental or experimental requests on time experience). The coding process of the content of a time period has been the focus of memory storage models (Ornstein, 1969), whereas the degree of attention devoted to time has been the core of attentional effort models (Thomas & Weaver, 1975). Both consider one single factor as the main determinant of time estimation accuracy. A dual-task paradigm was used to test both the subjects' activity and the content of the time period in a prospective time estimation task. The activity during a time period was examined by asking subjects to control the attention sharing, the coding level and the estimation strategies. The time period content consisted of short structured auditory events, characterized by a coherent or non-coherent sequence of simple tones. The results will be discussed in the light of a general systemic framework (Olivetti Belardinelli, 1986).

Department of Psychology, University of Roma & ECONA, Via dei Marsi, 78, I-00185 Rome, Italy

[PI-61] Attention and estimation of time in young children.

Sylvie Droit-Volet
Tatiana Gautier

The aim of this study in young children was to test predictions derived from attentional models of time estimation in adults, where subjective duration increases with the amount of attentional resources allocated to time. Children aged 3, 5, and 7 had to reproduce the duration (5 s or 10 s) of a stimulus in three successive trials. On the second trial, a distractor appeared. The results revealed that only at age 7 was the subjective duration shorter in the trial with the distractor than in those without. For 3- and 5-year-olds, subjective duration did not differ significantly across trials. These findings suggest that the development of abilities to selectively direct one's attention to temporal information is a prerequisite for variations in subjective duration with the amount of attention devoted to time.

Laboratoire de Psychologie Sociale de la Cognition, CNRS & Université Blaise Pascal, 34 avenue Carnot, F-63007 Clermont-Ferrand Cedex, France

[PI-62] Timing and interference with concurrent nontemporal tasks: General attentional resources or specialized processing?

In the literature on time estimation, the focus is on an interference effect in concurrent temporal and nontemporal tasks. This effect is usually attributed to a common pool of attentional resources for both tasks. The present research tries to find out which components of the Working Memory Model of Baddeley and Hitch (1974) are involved in the perception and memory for duration. Two experiments focused on the verbal slave systems of the working memory: the first experiment by using articulatory suppression; the second one by using a pre-load technique. In both experiments, subjects were requested to reproduce a previously experienced duration. On the one hand, results call for a timing model that incorporates specialized attentional processing resources, and on the other hand, for a general working memory model to incorporate duration perception and memory. The results obtained are discussed and compared with those reported in the literature (e.g. Brown, 1997).

Vicky Franssen

Department of Experimental Psychology, University of Gent, Henri Dunantlaan 2, B-9000 Gent, Belgium

[PI-63] Facilitation effect on congruent naming: Does inadvertent reading exist?

Céline Lemercier
Christophe Boujon

In a recent study, MacLeod (1998) shows that against interference effect, training or integration/separation of the two dimensions of composed item (colour/word) does not influence the facilitation effect. So, he considers "inadvertent reading hypothesis for facilitation" like a prevalent explanation of these results. This study tempts to respond of this on naming of congruent item. For that, we analyse the evolution of facilitation effect on four conditions of the same list. This list contains 1/3 of each type of items (congruent-incongruent-neutral). In the first condition, subjects must name all the items. In the second condition, the congruent items were framed and subjects must name all items too. In the third condition, the framed congruent items have to be read. In the fourth condition, the framed congruent items were replacing by incongruent items. Subjects must read them too, then they must name all the incongruent items. First results indicate that if the two congruent naming conditions (unframed and framed) drive to facilitation effect, reading consign drives to an interference effect. These results seem to relativize the "inadvertent reading hypothesis for facilitation".

Laboratoire de Psychologie: Cognition, Involution et Développement, UFR Lettres et Sciences Humaines, 11 Boulevard Lavoisier, F-49045 Angers, France

Chapter 6

POSTER SESSION II

[PII-1] Audiovisual integration in speech and in spatial scene analysis: A comparison.

Cecile Colin
Monique Radeau

The ventriloquism illusion consists in underestimating the spatial separation between visual and auditory signals coming from moderately separated locations. In the McGurk effect, the presentation of an audiovisual incongruent syllable elicits a new percept that is an integration of both modalities. This study aimed at assessing whether these two audiovisual interactions are affected by different degrees of spatial separation between the signals. The materials consisted in trains of three audiovisual monosyllables. They were visually displayed in front of the participants' head on a TV screen and auditorily played through one of nine hidden loudspeakers (placed every 20°, from straight ahead to 80° to the left or to the right). Two experiments were conducted in which the speaker's face was presented either upright or inverted. Each experiment included an identification task (to measure the McGurk effect) and a localization task (to estimate the ventriloquism effect). The ventriloquism effect was maximal (45%) at 20° and decreased as the loudspeaker position moved away to the left or to the right, but was not affected by the inverted presentation ofthe speaker's face. On the contrary, the McGurk effect (60% of illusions on average) exhibited the reverse pattern.

Free University of Brussels, Avenue F. D. Roosevelt, 50, CP 191, B-1050 Brussels, Belgium

[PII-2] Phonological activation of the non-target language: Does it depend on bilinguals' proficiency?

Àngels Colomé
Herbert Schriefers

There are currently two hypotheses about bilingual lexical access: the language-specific model claims that the speaker is able to restrict his/her search to the representations belonging to the language determined by the context, whereas the language-independent access model postulates that bilinguals conduct a parallel search in both languages. In preceding work (Colomé, 1998), we tested highly balanced Catalan-Spanish bilinguals performing a phoneme monitoring task on Catalan words "self-elicited" from pictures. We found that it took them longer to reject phonemes belonging to the Spanish translation of the target word than those not present in either the Catalan or the Spanish word. We therefore concluded the previous activation of the sublexical units of the non-target language and supported the language-independent model. However, most models postulate that in less proficient bilinguals, the words' resting level, as well as the strength of the conceptual connections are higher for L1 than for L2, and this should affect the amount of activation that each language sends to its phonological layers. In the two experiments reported here we address this issue and provide new data collected with the same procedure but in a group of less balanced Dutch-English bilinguals. In each case phoneme monitoring is performed on a different language, and thus activation for both L1 and L2 can be characterized.

Departamento de Psicología Bàsica, Universidad de Barcelona, Passeig de la Vall d'Hebron 171, E-08035 Barcelona, Spain

[PII-3] Nonlinearity of the speech/nonspeech boundary.

Pascal Dissard
Jay Holden
Guy Van Orden

Tuller et al. (1994) showed that slight changes in a single acoustic parameter of a word may give rise to abrupt changes in perception, implying that phonemic perception could be a nonlinear process. We used a similar method to explore the boundary between the perception of nonlinguistic versus linguistic stimuli. Subjects were presented with speech/noise continua made by incrementally substituting the end part of the speech signal with noise in 4 (Experiments 1-2) or 8 ms steps (Experiment 3). The continua ramped either from speech to noise then back to speech, or from noise to speech then back to noise. Subjects had to signal the presence of a phoneme /a/ (Experiment 1), a syllable /ba/ (Experiment 2) or the word /kat/ (Experiment 3). For sequential continua, analysis of data both across subjects and for individual subjects found a fluid speech/nonspeech boundary. The most common pattern was hysteresis; critical boundary effects are uncommon. A similar pattern was observed by Tuller et al. Thus, our results provide a conceptual replication of their findings, and further motivate a nonlinear dynamical account of speech perception.

Experimental Psychology, University of Sussex, Brighton BN1 9QG, United Kingdom

[PII-4] Acoustic-phonetic cues to word boundaries in French consonant clusters.

This research examined acoustic-phonetic cues to word boundary locations in French consonant clusters, and assessed their use in on-line lexical segmentation. Two word-spotting experiments were carried out. Participants detected CVC words (e.g., race) embedded initially or finally in paired CVCCV or VCCVC strings (rastu or utrace) extracted from two-word utterances that differed only in the word boundary location: either /VC#CV/ (race tuméfiée; minute race) or /V#CCV/ (rat stupéfait; menu trace). 'OBstruent+LIquid' medial consonant clusters were studied in initial and final word detection. They were compared to '/s/+OBstruent' clusters in initial word detection. Results for OBLI clusters showed that misalignment of target and utterance's first-word offsets produced a perceptual cost similar to that produced by misalignment of target and utterance's second-word onsets. By contrast, results for SOB clusters showed no effect of misalignment between target and utterance's first-word offsets. Durational analyses of the materials as well as of a large corpus of utterances revealed systematic variations in segment durations as a function of boundary location in OBLI clusters only. We conclude that the availability of acoustic-phonetic cues to word boundary location in consonant clusters depends upon the cluster class. When available, these cues are exploited in on-line lexical segmentation of speech.

Nicolas Dumay
Uli Frauenfelder
Alain Content

Laboratoire de Psychologie Expérimentale, Université Libre de Bruxelles, 50 avenue F. D. Roosevelt, CP 191, B-1050 Bruxelles, Belgium

[PII-5] Effect of cognitive load and its timing on semantic priming.

David Anaki
Avishai Henik

The current research examines the effect of a visual distractor on semantic priming. The distractor appeared alternatively at three stages of the inter-stimulus interval (ISI): simultaneously with the prime, immediately after its disappearance, or right before the target. A control condition was added in which the distractor did not appear at all. The subjects were asked to read the prime silently, ignore the distracor and perform a lexical decision task on a target. Each subject performed one condition only in four different blocks. The results show an equal amount of priming in all four conditions. However, comparing the results of the first block (i.e., the first quarter of the experiment), to the three other blocks reveals different patterns. In the first block priming was obtained only in the control condition or when the distractor was presented right before the target. In the three other blocks the priming effect appeared in all four conditions. These results are discussed in terms of (a) the involvement of spatial attention in word processing, and (b) the different stages of word processing which are influenced by spatial attention. Additional research is currently being conducted on the effects of various sizes of cognitive load on semantic priming.

Department of Behavioral Sciences, Ben-Gurion University of the Negev, 33 Shomron Street, Beer-Sheva, Israel 84814

[PII-6] Neighborhood size and frequency: Effects on pseudoword visual processing.

Two experiments investigated the effects of neighborhood size and frequency on pseudoword naming and visual lexical decision. Seventy-two five-letters pseudowords were created, by changing the first letter in Italian words. Two sets of stimuli characterized by either large or small neighborhood were obtained. Pseudowords with large neighborhood had a mean neighborhood size of 4.3, while pseudowords with small neighborhood had a mean neighborhood size of 1.3. Furthermore, pseudowords varied according to the neighbors' frequency: Half of the pseudowords had one orthographic neighbor of high frequency while the highest frequency neighbors of the other half were very much lower in frequency (mean frequencies: 229 and 19 per million, respectively). The four conditions produced a 2 (Neighborhood Size) $\times$ 2 (Neighborhood Frequency) factorial design, with 18 stimuli in each of the four conditions. The results of the two experiments showed a contrasting pattern. In the naming task response latencies varied as a function of neighborhood size: response latencies were faster when pseudowords had a large neighborhood. By contrast, in lexical decision a main effect of neighborhood frequency was found: The presence of a high frequency neighbor increased response latencies. The results are discussed in relation to current models of lexical access and reading.

Lisa Arduino

Christina Burani

Institute of Psychology, University of Roma "La Sapienza" (CNR), Viale Marx 15, I-00137 Roma, Italy

[PII-7] Syllables as visual units: Evidence from dyslexic and deaf children.

Cecile Ballaz
C. Marendaz
S. Valdois

The importance of syllables as phonological units is well established. Syllables are also considered as functional units in the visual analysis of words and word-like items. This hypothesis is in particular supported by data on illusory conjunctions (Prinzmetal, Treiman & Rho, 1986). However, the phonological or visual nature of syllable units in reading is largely questioned. This research aimed at showing that syllables are extracted as visual units in reading through a task of illusory conjunctions. Subjects were asked to report the colour of a target letter in briefly presented words or pseudowords. We hypothesised that if syllables act as visual units acquired during learning to read, colour-letter binding will depend on syllable colour (as a function of reading expertise) but not on lexical or phonological access. This task was proposed to control children from the 1st to the 5th grade and to two populations of deaf and dyslexic children very deficient in phonological coding. Results show that syllable effect increases with reading level in control children and that similar rates of illusory conjunctions were constrained by syllable units in both the deaf and dyslexic children, and the control subjects. These results are interpreted as supporting the existence of syllables as visual units.

Laboratoire de Psychologie Expérimentale, CNRS & Université Pierre Mendès France, BP 47, F-38040 Grenoble Cedex 09, France

[PII-8] Syllabic units in the cerebral hemispheres: Evidence from a lateralized priming experiment.

Two computerized word stem completion experiments with French words involving 96 and 64 subjects were conducted to evaluate the role on priming of syllabic congruency, namely, the correspondence between the stem to complete (e.g., MAR_) and the first syllable of the word used to prime it (MAR.TEAU or MA.RAIS). The first experiment used central visual field presentations, whereas the second used lateralized presentations. In the first experiment, more priming was observed in case of syllabic congruency, which was interpreted as suggesting that syllabic units may constitute one of the possible forms of French word representations in memory. In the second experiment, priming was higher when the right hemisphere received the information, which was interpreted as resulting from the overlap of perceptual features shared by the prime and the stem. However, only the left hemisphere was sensitive to the syllabic congruency. Indeed, more priming was observed when the stem corresponded to the first syllable of the prime, but only when the stems were presented to the left hemisphere. This result suggests that syllabic units are represented in the left hemisphere only.

Sandrine Belier

Olivier Koenig

Laboratoire de Psychologie Cognitive, Institut de Psychologie, Université Lumière Lyon 2, 5 avenue Pierre Mendès-France, F-69676 Bron, France

[PII-9] Interactions between phonological and orthographic codes in the processing of print.

Céline Chéreau
Pierre Halle
Juan Segui

Several studies suggest that language processing is lead by the activation of multiple knowledge sources. This study aimed at exploring interactions between orthographic and phonological codes in printed word processing. Four experiments were conducted using French printed words. Experimental stimuli were words containing a non-canonical grapheme-to-phoneme association, such as "caser" (/kaze/). Control stimuli were words such as "gazon" (/gazõ/) and "lasso" (/laso/), in which the association is canonical. A letter detection task was used in Experiments 1 and 2. In Experiment 1, words were presented for 56 ms. The false positive detection rate of 'z' was higher in "caser" than in "lasso". In Experiment 2, the presentation time was shorter (28 ms). In addition to the higher false positive detection rate of 'z', there were more misses of 's' in "caser" than in "lasso". Experiments 3 and 4 were designed to explore the effect of the orthographic code on phonological coding. Subjects had to "detect" phonemes /s/ and /z/. Words were presented for 56 ms in Experiment 3, and 28 ms in Experiment 4. The same pattern of results appeared for both durations: subjects made false positive detections of /s/ and misses of /z/ more often in "caser" than in "gazon". The effect was stronger than in Experiments 1 and 2. To sum up, the orthographic and phonological codes interact in the processing of printed words. However, the orthographic code seems to be prevalent in visual presentation tasks.

Laboratory of Experimental Psychology, Paris V University, 28 rue Serpente, F-75006 Paris, France

[PII-10] Prime processing in the so-called unconscious semantic priming paradigm.

This study investigated to what extent the prime is available to consciousness in the masked priming paradigm. Sixty words (and 60 pseudo-words) served as targets and three types of prime were used: a word semantically related to the target, an unrelated word, or a blank. The prime duration varied from 17 ms to 83 ms and the SOA, including a mask (XXXX), was of 1000 ms. Experiment 1 comprised two experimental blocks: a first block in which a target lexical decision task was used and a second block (with the same trials in a random order) in which a prime detection and identification were required. Experiment 2 comprised a single block with the three tasks to perform in each trial. The main result was that none of the prime durations provided a subliminal condition of presentation whether a strict criterion (no detection) or a lenient criterion (no identification) served to assess unconscious processes. No unconscious semantical priming was found: on the contrary, priming was observed only for the longer prime durations (66 and 83 ms) which were associated with perfect identification of the prime. Therefore, whether the attention is focalized on either the target or the prime (Experiment 1) or on both stimuli (Experiment 2), semantic priming occurs in presentation conditions allowing the prime to be consciously identified.

Sandrine Delord

Unité de Neuropsychologie Cognitive, Département de Psychologie Cognitive, Université Lumiére Lyon 2, 5 avenue Pierre Mendès-France, F-69676 Bron cedex, France

[PII-11] Age of acquisition norms for Dutch words.

Wendy De Moor
Mandy Ghyselinck
Marc Brysbaert

Recently it has been claimed that frequency effects in word processing are largely an artefact of age-of-acquisition (AoA); that is, the age at which words were learned. AoA norms are abundantly available for the English language but not for the Dutch language. Therefore AoA norms for 2816 Dutch four- and five letter words were collected. In our study 559 undergraduates were asked to indicate at which age they thought they had acquired the words. These norms were further corroborated by presenting a sample of the stimuli to children of different ages.

Department of Experimental Psychology, University of Gent, Henri Dunantlaan 2, B-9000 Gent, Belgium

[PII-12] The value of the letter search task for visual word recognition.

To investigate the role of phonological encoding in visual word recognition, Ziegler and Jacobs (1995) made use of the letter search task. In this paradigm, participants are asked to decide quickly and accurately whether a previously shown target letter is part of a visually presented word or not. In two experiments, we examined the properties of the letter search task based on decision latencies, in order to assess its utility for future research in visual word recognition. In Experiment 1, we looked at the effects of letter position, letter type (consonant or vowel), and response type (present/absent) on the letter search times. All three variables had a significant effect and interacted with one another. In Experiment 2, we found that, if the analyses are restricted to the present trials, the letter search task is sensitive to some robust effects in visual word recognition, such as word frequency and repetition priming. Age-of-acquisition and imaginability of the words had no effect on the letter search times.

Timothy Desmet
Marc Brysbaert

Department of Experimental Psychology, University of Gent, Henri Dunantlaan 2, B-9000 Gent, Belgium

[PII-13] Top-down influences on the reading of proper names.

Corrado Lo Priore
Tim Brennen

Two experiments are reported that investigate top-down influences on proper name processing. In Experiment 1 Norwegian subjects were presented with a first name and a surname on each trial and had to decide whether both were correctly spelt: a lexical decision task on proper name phrases, i.e., Roald Hansen = "Yes", Poald Hansen = "No". Half of the positive stimuli were names of famous people (e.g., Bjørn Dæhlie, Morten Harket), and, in line with Valentine et al.'s (1991; 1996) model, RTs for these were shorter than RTs for nonfamous combinations (e.g.: Bjørn Harket, Morten Dæhlie). In Experiment 2 the subjects' task was to decide whether a letter string could be split into two Norwegian words: of the "decomposable" stimuli, half were known as surnames (e.g., Båtnes, Forberg), and half were not (e.g., Båtberg, Fornes). The RTs for the familiar surnames were shorter than those for unfamiliar letter strings. The benefit observed for letter strings known as surnames is evidence for top-down priming on word recognition unit's activation from proper name lemmas, and is consistent with Valentine et al.'s model. Cohen's (1990) arbitrariness hypothesis will also be discussed in relation to our results.

Institute of Psychology, University of Pavia, Piazza Botta 6, Pavia, Italy

[PII-14] Orthographic word shape in German and the missing-letter effect.

Letters are more difficult to detect in common function words such as the than in content words. According to the unitization account this missing-letter effect (MLE) is because familiar words allow rapid access to whole-word representations, thus circumventing access to their constituent letters. According to the structural account, in contrast, function words are initially used by the reader as cues for structure, but then recede to the background as the focus of processing shifts from structure to meaning. In this study we exploited the rule that in German nouns must always be capitalized. We reasoned that such capitalization may facilitate structural analysis by allowing nouns to be easily assigned to their proper grammatical class. If so, orthographic variations that deviate from this rule may reduce the magnitude of the MLE either because they impair structural analysis or because they destroy the familiar shape of the word. We explored the effects of several such orthographic variations in German (e.g., capitalizing function words) in an attempt to evaluate the possible contribution of visual familiarity and structural role to the MLE. The results are discussed as they bear on the unitization and structural models of reading.

Monika Nisslein
Jochen Müsseler
Asher Koriat

Max Planck Institute for Psychological Research, Leopoldstraße 24, D-80802 Munich, Germany

[PII-15] Lexical neigbourhood and frequency of print-to-sound associations in printed word naming.

Ronald Peereman
Nicolas Dubois Dunilac

Several studies show that printed word naming is faster when the target is both orthographically and phonologically similar to other words (neighbours). This finding has led to assume that print-to-sound conversion processes are influenced by lexical knowledge. However, neighbourhood density manipulation entails correlated variations in the frequency of print-to-sound associations. Words having numerous neighbours generally include more frequent associations. Thus, any advantage of words with many neighbours might result either from lexical neighbourhood activation or from stronger print-to-sound associations. This question was explored in three experiments using French words. In Experiments 1 and 2, the influences of neighbourhood density and frequency of print-to-sound associations were assessed separately holding the other variable constant. Using words matched for neighbourhood density, Experiment 1 showed better naming performance for words including frequent print-to-sound associations. When words were matched for association frequency, no neighbourhood effect was observed (Experiment 2), but a clear advantage of the same set of words with many neighbours came out when the controls had both few neighbours and rare print-to-sound associations (Experiment 3). The findings are discussed within the framework of interactive activation models.

Laboratoire d'Etude de l'Apprentissage et du Développement, CNRS & Université de Bourgogne, 6 boulevard Gabriel, F-4621000 Dijon, France

[PII-16] The effects of diacritics on visual word recognition in Hebrew: Differential processing in the left and right cerebral hemispheres.

Eva Smolka
Zohar Eviatar

Diacritics specify the vowel information of a word in Hebrew orthography. Previous studies have shown that skilled Hebrew readers are unable to disregard incorrect vowel information in naming tasks. Neuropsychological studies have suggested that the right hemisphere (RH) is not capable of phonological processing. This study explored whether the two hemispheres extract the same information from diacritics. Unambiguous words with correct diacritics (CD), incorrect diacritics (ID, in which vowel information specified a nonword), and figural diacritics (FD, in which diacritics were replaced with geometrical forms) were presented in peripheral (LVF/RH, RVF/LH) and central vision (CVF). In the RVF/LH and CVF, FD did not result in a significant interference effect, while ID resulted in a significant delay of naming responses. In the LVF/RH both ID and FD resulted in significant slowing of naming responses as compared to CD. This suggests that the RH processes diacritics as nonlanguage specific visual forms, whereas the LH processes diacritics phonologically. The results converge with findings in English that the RH is not capable of phonological processing. The similar performance patterns of RVF/LH and CVF are congruent with LH dominance in normal reading. The significance for dual route models and findings on hemispheric differences is discussed.

IIPDM, Institute of Information Processing and Decision Making, Department of Psychology, University of Haifa, Mount Carmel, Haifa 31905, Israel

[PII-17] Shared neighborhood effects in masked orthographic priming.

Walter J. B. van Heuven
Ton Dijkstra
Jonathan Grainger
Herbert Schriefers

Several studies have found effects of orthographically related masked nonword primes on lexical decisions to target words. These effects have been explained by the neighborhood characteristics of the target word (Forster, 1987), but neighborhood characteristics of the prime are also found to be important (Hinton, Liversedge, & Underwood, 1998). In this study, we present a new account of masked form-priming effects based on the "shared neighborhood" of prime and target. Shared neighbors are words that are activated by both prime and target. According to the Interactive Activation (IA) model (McClelland & Rumelhart, 1981), shared neighborhood determines the size of priming effects. Thus, the ambiguity effect observed by Hinton et al. (1998) in a partial priming paradigm can be reinterpreted in terms of shared neighborhood density. The IA models predictions were tested and confirmed in a masked priming experiment manipulating the shared neighborhood density of complete primes.

Nijmegen Institute for Cognition and Information (NICI), University of Nijmegen, P.O. Box 9104, NL-6500 HE Nijmegen, The Netherlands

[PII-18] Dynamic control of interlingual homograph interference in bilinguals.

Roswitha von Studnitz

David W. Green

Dijkstra, van Jaarsfeld and Ten Brinke (1998) showed that Dutch-English bilinguals, performing an exclusive lexical decision task (LDT) in English, reacted more slowly to non-cognate interlingual homographs, such as "ANGEL" ('heavenly messenger' in English, 'sting' in Dutch), compared to matched English controls only when purely Dutch words were included among the stimuli. We examined the issue of the control of interlingual homograph (IH) interference using proficient German-English bilingual speakers. Three matched groups of bilinguals (N=16 per group), and a unilingual English baseline group, performed an English-exclusive LDT. Items for decision included non-cognate IHs (e.g. "TAG"—German: 'day', English: 'label') and their purely English matched controls (e.g., "RIB"). All groups were instructed in English and two of the bilinguals groups were informed, in addition, that there might be English words which were also German words (IHs). In such circumstances, they should still depress the 'yes' response key. Relative to the baseline group, all the bilingual groups showed IH interference. However, interference was greatest for the bilingual group who received purely German words, rather than German nonwords (e.g., "PFITZE"). Critically, the interference for this group declined markedly from the first block of experimental trials to the second, consistent with the idea that bilinguals can control IH interference. We consider the possible loci of such control.

Department of Psychology, University College London, 26 Bedford Way, London WC1H 0AP, United Kingdom

[PII-19] Attentional bias associated with anxiety states: Effects of inhibitory mechanisms.

Celine Borg
Jean-Claude Bougeant

Laboratoire de Psychologie Cognitive, EA 1997, Equipe Cognition-Emotion, Université Lumière Lyon 2, 5 avenue Pierre Mendès-France, F-69676 Bron Cedex, France

Interference effects on threat words in anxious subjects on an emotional Stroop task have generally been interpreted as evidence for mood-congruent attentional bias in anxiety states. The anxious subjects appear to be unable to efficiently inhibit the irrelevant information when this information is emotionally negative in valence. So, two experiments have been led in order to determine how experimentally induced anxiety could influence inhibitory mechanisms involved in selective attention. The aim of these experiments is to complement a previous research, in which an attentional bias toward emotional words in anxious subjects was observed with a modified Stroop task. These experiments contribute to the specification of the nature of the mechanisms involved in this bias. Therefore, the paradigm consisted of investigating the time course of the effects of inhibition by manipulating the time interval (ISI: inter stimulus interval) between the presentation of a prime printed in black and the presentation of a target printed in color. The results of these experiments showed that effects of attentional bias differentiate anxious subjects from control subjects, according to the type of prime presented (a word, a chain of characters, a dot, or nothing). The results are consistent with an effect of attentional preparation by means of the prime, rather than an impairment of inhibitory mechanims.

[PII-20] Negative priming in a gender decision task without prime or target selection.

In a typical negative priming paradigm, participants are exposed to prime and target displays containing distractors that must be ignored. When the target is the same as (or related to) the previously ignored distractor, responses are generally slower than when the target is unrelated to prime display. In five experiments, using a gender decision task, we demonstrated that negative priming can also be observed without the selection of one of two simultaneously presented items, either in the prime display, or in the target display. In Experiment 1, responses were slower when prime and target had the same gender than when they had different genders. Moreover, this negative priming disappeared when the prime processing time (Experiment 2), or the prime perceptibility (Experiment 3) were reduced, and a positive priming was observed even when the prime perceptibility was highly reduced (Experiment 4). Experiment 5 eliminated a possible explanation of negative priming in terms of response inhibition during the prime processing. The results are explained by an interference that could result from a comparison between the perceptual representation of the probe and the mnesic representation of the prime when conflicting properties are associated to the prime and the probe.

Allain Gael
Rémy Versace

Laboratoire de Psychologie Cognitive, E.A., Université Lyon 2, 5 avenue Pierre Mendès-France, F-69676 Bron Cedex, France

[PII-22] The effects of training on negative priming and Stroop tasks with 3 perceptual dimensions (3D).

Karen Lemoine
Céline Lemercier
Christophe Boujon

Using a similar material and manual response, two experiments examined the course of interference and inhibition during training. Fox (1995) indicated that the Stroop task (1935) reflects early selection (interference) whereas negative priming (NP) task (Tipper, 1985) measures late selection (inhibition) of information. If this assumption is correct, the effects of practice on tasks will have to be dissimilar performances. The material is constitued by items involving one, two or three dimensions: colour, location, identity. In the 3D negative priming task, subjects reported the location of target specified before by a colour cue. In the 3D Stroop task, subjects indicated the ink colour of the item (neutral, congruent and incongruent). On the 1st day, the data in both tasks replicated classical results (MacLeod, 1991; Tipper, Weaver & Houghton, 1994). Over 7-day training sessions, the median RT's decrease for all conditions of both tasks. However, interaction effects between training and type of item (neutral vs incongruent in Stroop task, or negative priming vs control in NP task) were not significant. If the training effect can't explain any difference between interference and inhibition (see Tipper, Eissenberg & Weaver, 1992); in contrast, the addition of dimension increases interference effect but inverses negative priming effect.

Laboratoire de Psychologie de la Cognition, de l'Involution et du Développement, Université D'Angers, 11 Boulevard Lavoisir, F-49045 Angers cedex, France

[PII-23] Electrophysiological indices of visuo-spatial attention with the geodesic dense array sensor net.

Eduardo Madrid
Pío Tudela
Juan Lupiáñez

Peripheral cues have been shown to capture attention regardless of whether the cue predicted the position of a subsequent target stimulus, produce a facilitation in RT at SOAs from 50-100 ms and, after 200 ms, RTs are slowed relative to neutral conditions, the 'inhibition of return' (IOR) effect. Visual event-related potentials were measured for peripheral target stimuli that were preceded by a peripheral dot. Targets appeared either at the same location as the dot or in the opposite visual hemifield. Same- and opposite-location trials were equiprobable. A detection response was to be made by the subject and there were 33% of catch trials. We will display topographic maps based on recordings from 128 recording sites on the scalp (EGI system). The subjects were faster to the invalidly cued targets, the IOR effect. The pattern of ERP effects were amplitude differences in the N1 over parieto-occipital areas for right visual field targets (RVFT) and over rather more anterior areas for LVFT. We recorded a suppression of the P1 on valid trials that could be related with the IOR. Furthermore, we recorded a dynamic redistribution of Negative-Positive complex over the parieto-occipital area for invalidly cued targets but not for validly cued targets at about 160 ms post-target. This dynamic redistribution was clockwise for LVFT and counterclockwise for RVFT, starting the negativity in those complex contralateral to the cue and finishing contralateral to the target. We suggest that this dynamic redistribution is related with the shift of visual attention. Our results agree to some extent with other results obtained with the classical 10/20 system and go further offering a much more exhaustive spatial sampling of the scalp electrical activity.

Institute of Cognitive and Decision Sciences, University of Oregon, 1227 Straub Hall, Eugene, OR 97403-1227, USA

[PII-24] Feature binding at different processing levels: Relational vs. activation coding in cognition.

Antonio Raffone
Marta Olivetti Belardinelli

Department of Psychology, University of Rome "La Sapienza" & ECONA, Via dei Marsi, 78, I-00185 Rome, Italy

Most cognitive models explicitly or implicitly refer to cognitive operations and working memory processing in terms of activation. We propose an alternative view, in which activation coding, based on an absolute variable, functionally coexists with relational coding, in which the activation value of a given processing modules or representational node is referred to the activation values of other modules or nodes. We demonstrate by means of computer experiments, how these two coding and processing strategies may work in multilevel feature binding. Feature binding is a complex cognitive process based on multiple processing stages. At a low level, binding operations of perceptual segregation and grouping take place in areas V1 and V2 of the visual cortex. In our model, these parallel compositional processes are mediated by the selective synchronization of neural activities, in terms of relational or temporal coding. Higher level binding (for instance, in areas V4 and IT of the visual cortex) is plausibly mediated by top-down selective attention. We modeled these serial processes in terms of activation level modulation (activation coding) through feedback connections; this attentive top-down modulation takes place on a slower time scale with respect to synchronization-based processing. Finally, we modelled feature binding in visual working memory. As Luck and Vogel (1997) have shown, feature conjunctions are stored as integrated units in visual working memory. Our computer simulations point out that the limited capacity of visual working memory for features and conjunctions could be explained in terms of relational coding (time correlations), as in low level binding. Moreover, we point out that the cerebral cortex could use the same functional logic in different cognitive processes.

[PII-25] Associative negative priming in the visual identification of words.

José Miguel Rodríguez-Santos

Marina Calleja-Reina

Negative priming is defined by slower responses and/or higher error rates to items that serve as distractor in an immediately preceding display. At this moment, the phenomenon of the negative priming relies on two explanatory hypotheses. On the one hand, the based-inhibition hypothesis, which considers the negative priming as evidence of the active inhibition of the unwanted information. On the other hand, the episodic retrieval hypothesis that supports that the negative priming is caused by the automatic retrieval of the information from the prime display. This information is in conflict with the correct responses required in the probe trial. There is evidence of several modalities of negative priming but no evidence of associative negative priming has been found yet. Associative priming has normally been linked to semantic priming, because the words with an associative link usually have a semantic link too. It is difficult to get enough words that show a purely associative (not semantic) link, but they exist. In our study, the usual procedure of negative priming has been used. That is, at the prime trial, it was displayed a prime item and then, a pair of stimuli were showed (target and distractor). The subjects had to answer the target item, and had to ignore the distractor. At the probe display, the target item was the same stimulus that had just been ignored at the prior prime display. In our study, we have obtained some evidence that supports the existence of associative negative priming. This evidence disputes the automatic versus strategic nature of the associative negative priming phenomenon.

Departament of Basic Psychology, University of Malaga, Málaga, Spain

[PII-26] Effect of attending vs. ignoring distracting semantic information in a Stroop task.

Charo Rueda
Pío Tudela

The semantic priming paradigm has been usually utilised to study the way lexical knowledge is coded and retrieved from semantic memory. On the other hand, we conceive attention as a central mechanism to control information processing, by activating relevant information and inhibiting irrelevant distracting information (Posner & Snyder, 1975). Positive and negative priming are regarded respectively as the result of the action of these two attentional mechanisms. In our study, a prime word was followed by a coloured word, and participants were asked to name its colour (Stroop task). The prime and probe words could be either semantically related or unrelated. In this paradigm activation of the distracting semantic information of the probe stimulus should lead to bigger interference, whereas inhibition of semantic information should reduce interference. Across several experiments we manipulated instructions to attend vs. ignore the prime stimulus, and its duration. Both instruction manipulations and prime duration modulated probe interference. These data support an attentional theory of semantic priming in which ignored information is processed at a semantic level.

Departamento de Psicología Experimental, Facultad de Psicología, Universidad de Granada, Campus de Cartuja, S/N, E-18071 Granada, Spain

[PII-27] Cerebral lateralization for speech production in deaf people exposed to cued speech.

Murielle D'Hondt

Jacqueline Leybaert

Recently, there have been many studies on cerebral organization of language in deaf people using Sign Language, but few have been done on cerebral organization of language in deaf persons exposed to oral language. The present research investigates cerebral lateralization of speech production in deaf youngsters exposed to Cued Speech (CS). CS is a manual code that completes the information given by lipreading (see Leybaert & Charlier, 1996). We have used an adaptation of the dual-task paradigm employed by Corina, Vaid and Bellugi (1992) for sign language. Participants have to shadow linguistic and non-linguistic stimuli while tapping as fast as possible on a telegraphic key. Neville (1991) has hypothesized that early exposure to a grammatically structured language is the important factor in the development of the specialization of the neural system within the left hemisphere for language. Since, she has provided much evidence supporting this point of view, and the results of Corina (1992) support that point of view too. We hypothesized that deaf people exposed early to CS are susceptible to show a similar pattern of hemispheric specialization for language as hearing people. First analysis of our data does provide evidence in that sense.

Laboratoire de Psychologie Expérimentale, Université Libre de Bruxelles, avenue F. D. Roosevelt 50, CP-191, B-1050 Bruxelles, Belgium

[PII-28] Evidence for different categorical judgment subsystems in patients with left-hemisphere lesions.

France Ginchereau
Olivier Koenig
Catherine Thomas-Antérion
Bernard Laurent

Left parietal lesions may lead to finger agnosia, agraphia, acalculia and left-right confusion. In this study, two patients (A. H. and J. M.) with lesions located in different areas of the left parietal lobe and control subjects were asked to make categorical spatial relation judgments. In Experiment 1, subjects were required to evaluate the position of one object relative to another. Results showed a selective left-right distinction deficit in A. H. and a selective inside-outside distinction deficit in J. M. In Experiment 2, patients had to focus on the relative position of two objects contained in a multiple object display. The results confirmed those observed in Experiment 1 for both A. H. and J. M. Furthermore, different left-right and inside-outside judgments, depending on the reference frame critical for the task, rendered different patterns of performance. Based on these results, we suggest that patients with different left hemisphere lesions might show different patterns of categorical judgment deficits and that the left-right confusion observed in some left-hemisphere patients might be decomposed into finer processing deficits that vary according to the stimuli and task demands.

Département de Psychologie Cognitive, Université Lumière Lyon 2 & Bellevue Hospital Saint-Etienne, 5 avenue Pierre Mendès-France, F-69676 Bron Cedex, France

[PII-29] Emotional information processing: Evidence for a dissociation between pathways mediating positive and negative informations in Alzheimer type patients.

Our study concerned the influence of damage to the amygdala and hippocampal systems in mild dementia Alzheimer type (DAT), on emotional memory representations, emotional processing and emotional responses. In a priming paradigm, participants had to evaluate target words as positive or negative. The targets were preceded by emotionally congruent or emotionally incongruent prime words. The SOA between the prime and the target was 50 ms or 300 ms, and the prime was masked or unmasked. Results showed a negative emotional priming effect at 50 ms with positive targets, and a positive emotional priming effect at 300 ms with negative targets. These data demonstrated a dissociation between the emotional processing of negative information and positive information: Neural pathways mediating positive information and those mediating negative information seem to be differently impaired in DAT. Moreover, the direction of priming effect observed at 50 ms in our population was exactly the reverse as that we previoulsy observed in normal subjects (Padovan & Versace, 1998). These findings are discussed in terms of consequences of amygdala damage (the amygdala seems to be critical for the processing of negative information), in terms of a dual representation of emotion in memory, and in terms of mood modification induced by the task.

Cathérine Padovan
Thomas Antérion
Rémy Versace
Bernard Laurent

Département de Psychologie Cognitive, Université Lumière Lyon 2, 5 avenue Pierre Mendès-France, F-69676 Bron Cedex, France

[PII-30] Separate subsystems for the processing of negative and positive emotional visual stimuli.

David Sander
Olivier Koenig

Three divided visual field experiments involving 24 participants each were conducted to assess hemispheric specialization for the processing of visual emotional stimuli. In the first experiment, participants were asked to judge the emotional polarity of pictures. In the second experiment, participants were presented with the same pictures as in Experiment 1. However, they were asked to decide whether the upper and the lower picture's borders had the same texture or not. In the third experiment, participants were presented with the same task as in Experiment 2. However, pictures had been filtered so as to avoid any access to the emotional content. Results of Experiment 1 revealed that participants responded relatively faster to negative pictures when information was presented to the left hemisphere, whereas they responded relatively faster to positive pictures when information was presented to the right hemisphere. This result was interpreted as suggesting that separate subsystems process negative and positive emotional stimuli. Results of Experiment 2 revealed a similar pattern of results as those of Experiment 1, which suggested that the emotional content of the stimuli was processed implicitly. Results of Experiment 3 did not replicate the results of Experiment 1 and 2, which confirmed that the lateral differences observed in the first two experiments were due to the emotional content of the stimuli.

Laboratoire de Psychologie Cognitive, Unité de NeuroPsychologie Cognitive, Université Lumière de Lyon 2, 5 avenue Pierre Mendès-France, F-69676 Bron Cedex, France

[PII-31] Gender is a key to face recognition.

Two experiments were carried out to investigate the influence of gender classification on face recognition processing. Subjects had to search the face of a target celebrity (Experiment 1) or had to search a composite face building from unknown faces of one woman and one man (Experiment 2) among a list of faces belonging to unknown men and women. The composite face could look either like a man or like a woman. Experiments 1 and 2 results indicated that subjects throwed out faster faces of opposite gender relative to the target face gender. Experiment 2, using composites faces having the same structural distance from the two original faces, showed that this gender effect did not result from a structural influence of a gender dependent configuration on the matching process between the perceptual input and the mnesic representation of the face. Rather, the early gender categorization of a face appears to be able to interrupt the comparison process between perceptual input and mnesic representation.

Jean-Yves Baudouin
Guy Tiberghien

Institut des Sciences Cognitives, UPR 9075 CNRS, 67 boulevard Pinel, F-69675 Bron Cedex, France

[PII-32] Face Inversion modifies an electrophysiological correlate of multimodal emotional perception.

Gilles Pourtois
Beatrice de Gelder
Jean Vroomen
Bruno Rossion

Cognitive Neuropsychology Unit, Tilburg University, Warandelaan 2, P.O. Box 90153, NL-5000 LE Tilburg, The Netherlands

Multimodal perception can be investigated in a paradigm where concurrent emotions in the voice and in the face are presented (e.g., Massaro, 1998). This experimental situation leads to a compelling integration (de Gelder, Bocker, Tuomainen, Hensen & Vroomen, in press). Behaviourally, face inversion prevents this automatic integration (de Gelder, Vroomen & Bertelson, 1998). In the present study, event-related potentials have been used with 6 subjects to test whether an auditory electrophysiological correlate of multimodal perception would show any change when face orientation is manipulated. Upright and Inverted faces evoked a face-specific positive component (for upright orientation, mean latency at Cz: 172 ms, mean amplitude: 3.75 Uv; for inverted orientation, latency at Cz: 186 ms, amplitude, 3.96 Uv) which usually occurs around 180 ms after face onset (Jeffreys, 1996) and which is delayed for the upside-down orientation (Rossion, Delvenne, Debatisse, Goffaux, Bruyer, Crommelinck & Guerit, in press). For the auditory ERPs, the different trials evoked comparable early components (e.g., N1 and P2). In contrast with bimodal trials with upright faces, emotional voice fragments following inverted faces evoked a delayed auditory N300 component in the deviant condition (for deviants, latency at Cz: 319 ms, amplitude: -2.64 Uv; for standards, latency: 304 ms, amplitude: -3.02 Uv). Around 300 ms after voice onset, the emotional change induced by the deviant inverted facial expression has a differential impact on the auditory processing in comparison with the presentation of upright faces. These findings are compatible with the previous behavioural results (de Gelder et al., 1998) and are discussed against the 'emotional event integration' model (Halgren & Marinkovitch, 1994).

[PII-33] Is gender processing from face really parallel to face recognition?

Bruno Rossion
Laurence Robaye
Sylvie Linotte
Raymond Bruyer

According to the classical model of face processing (Bruce & Young, 1986), gender decision on faces is a parallel function to the face recognition process per se. However, data from eye movements recordings and behavioral studies on the role of internal and external parts in face processing suggest that perceptual analysis of the face depends on face familiarity (Bruyer & Brédart, 1994). Moreover, no double dissociation between face recognition and gender processing has yet been described in lesion studies (Bruyer & Brédart, 1994). We reinvestigated the question of the independance between face recognition and gender processing by taking advantage of a morphing technique (Beale & Keil, 1995) which allows to create a continuum between two different faces. In the present study, familiar (learned) faces were morphed with new faces, generating facial continua of face familiarity. Using classical categorization and discrimination tasks, we first shown that faced with such a continuum, subjects generate a sharp boundary between "familiar" and "unfamiliar" faces. In another trained group of subjects (12), the task was to make a gender decision on faces. Our results clearly show a significant drop in correct reaction times for morphed faces classified as familiar by the first group. No difference was found for a third, untrained, group of subjects for the gender decision task. These results indicate that facial recognition facilitates gender processing and argue for a modification of the classical cognitive face processing model.

Unité de Neuropsychologie Cognitive, Université catholique de Louvain, 10 Place du Cardinal Mercier, B-1348 Louvain-la-Neuve, Belgium

[PII-34] Aspects of person recognition: Preschoolers, school children and adults identification.

Katja Seitz
Ruth Limmer
Ruth Schumann-Hengsteler

Due to the lack between studies on face processing on the one hand and research on eyewitness testimony on the other hand and the missing interlinks between those two bodies of literature we want to present research located in between these areas. We apply the experimental methodology of face recognition studies with an extended target material, pictures of unfamiliar whole persons. Short-term memory processes in 6-, 8-, and 10 year-old children and adults are of special interest. Our material consists of black and white photographs of women presented in various conditions. In a series of experiments we contrast face recognition material with pictures of whole persons and combine them in the presentation- and recognition phases. Target present conditions and target absent conditions are realized. Distractors were controlled in hair color and style, body structure and posture as well as clothing. Target presentation was immediately followed by the line up presentation of the target and the three distractors or, in target absent conditions, of four distractors. An age effect, an effect of condition and an interaction between these two factors were observed in correct recognition of the target present study. In the target present/absent study an interaction (age $\times$ condition) did not appear. Our findings indicate that different cognitive processes are used in face recognition compared to person recognition.

Entwicklungs- und Pädagogische Psychologie, Katholische Universität Eichstätt, Ostenstraße 25–28, D-85072 Eichstatt, Germany

[PII-35] Exploring the oscillation effect with point light walkers.

The point light walker is a well-known stimulus in research on biological motion perception. It is constructed by attaching point light markers to the main joints of a walking person. Using a motion capture technique we created a point light walker. The walker in our animations shows no occlusion, has a constant point light size and luminance, and is projected orthographically on the screen. Such a stimulus has perfect ambiguity: in a non-sagittal view it is impossible to determine which way the walker is oriented. In fact the stimulus is bi-stable: it can either be perceived as approaching or moving away from the viewer's perspective. Because of this bi-stability, the direction of rotation of a walker round its vertical axis is also ambiguous: clockwise and counter-clockwise motions share projective identity. Therefore it is possible to interpret a walker rotating in depth as occasionally or perpetually oscillating, analogously to Ames' window. In one experiment, participants presented with a rotating bi-stable walker had to report the number of perceived reversals. The number of reported reversals can reveal whether there is a preferred interpretation of the stimulus—for instance whether the viewer prefers to interpret the walker as approaching rather then receding. In further experiments we analyse this preference.

Mathias Dekeyser
Jan Van Rie
Karl Verfaillie

Department of Psychology, University of Leuven, Tiensestraat 102, B-3000 Leuven, Belgium

[PII-36] Representational systems in transsaccadic object perception.

Filip Germeys
Peter De Graef
Karl Verfaillie

To account for the integration of extrafoveal and foveal views across eye movements, two representational systems have been proposed. The first is a permanent lexicon of object detectors, which fire whenever evidence for particular objects is apprehended, regardless of their location. The second is a set of temporary, episodic object files, which each are constructed for a specific object occupying a particular location in space. In the experiments from which these two representational systems were inferred, observers typically were required to make a saccade to a location in between two extrafoveal target objects. The target objects were or were not shifted during the saccade and subsequent ease of target identification was measured. In the present study, participants were required to make a saccade to a specific target object as opposed to a location in between two objects. This situation, in which a single object to which the eyes are to be sent is selected, is not only less artificial but also creates different attentional demands. As such, the goal of this study is to test the theoretical propositions of the dual representational system under more natural circumstances for saccadic and attentional processes.

Laboratorium voor Experimentele Psychologie, Katholieke Universiteit Leuven, Tiensestraat 102, B-3000 Leuven, Belgium

[PII-37] The influence of chromatic and luminance background on form detection.

Martine J. E. Van Zandvoort

Marco Puts

Previous studies have demonstrated the existence of two parallel and separate retino-geniculo-striate pathways within the visual system, the parvocellular and the magnocellular pathways. However, to what extent both pathways function independently is still subject to debate. Experiments with luminance and chromatic background flicker suggested that respectively the M-pathway and the P-pathway can be saturated in a dissociable manner creating the possibility to examine the functional contribution of both subsystems (Hecker & Mapperson, 1997; Brigell et al., 1996). In our explorative study we used a form detection task in which a target of four dots had to be detected in two types of dot configurations, one more depending on form discrimination than the other on three different backgrounds (chromatic or luminance background flicker, or a steady background) (Puts et al., 1997). The results supported our hypothesis that an isoluminant chromatic background flicker causes an increase in reaction time compared to a steady or a luminance background flicker in the form dependent dotconfiguration whereas no significance was reached in the less form dependent condition. These results are congruent with the theory that both colour and form are processed by the P-pathway, and encourages the use of background flicker as a research method.

Psychological Laboratory, University of Utrecht, Heidelberglaan 2, NL-3584 CS Utrecht, The Netherlands

[PII-38] Visuo-spatial working memory: Experimental and developmental fractionation.

Nathalie Fournet
Catherine Monnier

In Baddeley's model of Working Memory (1986), VSSP was defined as a component responsible for temporary maintenance and processing of visual and/or spatial information. More recently, Logie (1995) proposed to dissociate VSSP into a temporary visual cache for storing visual form and a spatially oriented inner scribe. There is some evidence supporting this assumption; for example, the developmental fractionation observed by Logie and Pearson (1997). The aims of our study are (1) to replicate the developmental fractionation of VSSP; (2) to test an experimental dissociation by introducing a short or a long delay between presentation of the information the subject has to retain and the test. The study is conducted with children (7–8 and 10–11 years old) and adults. Two memory tasks are proposed. The pattern span task (Wilson, Scott & Power, 1987) is thought to rely on the visual component of VSSP. The location span task is assumed to involve the spatial component. It consists in remembering an increasing series of filled squares presented sequentially in a 6×6 matrix and to detect the missing square on test. Each subject was submitted to the two STM tasks, the delay between presentation and test being constant for a given subject (2 vs 8 sec. delay). We expect an effect of delay on the pattern span (see Wilson et al., 1987) but no effect of delay on the location span (because of the possibility for the subject to actively refresh spatial information). This result will indicate an experimental dissociation between the two tasks. Furthermore, we postulate an interaction between age and type of task: the difference of span between the two tasks will increase with age (developmental fractionation).

Laboratoire de Psychologie Expérimentale, Université de Savoie, Jacob Bellecombette, BP 1104, F-73011 Chambéry, France

[PII-39] Spatial cognition: Functional determinants of spatial coding in perception and memory.

Spatial cognition is of central importance for a wide range of everyday human activities. Many of these actions rely on perceiving and remembering spatial relations. Rather little, however, is known about the specific aspects of the cognitive coding of these relations. We challenged the question whether functional factors, e.g., object related actions, are integrated in the spatial representation. Our investigation explored the structure of the perceptual and memory based organization of spatial information in three experiments. Participants were confronted with configurations of objects (houses on a map) which were organized by either simple or complex actions to form different cognitive clusters. Participants then took part in two tasks: an estimation of Euclidean distance between pairs of objects and a judgment of relative position of pairs of objects. In all experiments, times for verification of relative position, but not distance estimations were affected by cluster membership: Spatial relations between objects of the same cluster (e.g., same key-press) were verified faster than those between objects of different clusters, even if the spatial relations were otherwise identical. These results did not depend on whether judgment was based on information that was perceptually available or memorized. This suggests that perceptual, not memory processes caused the effect.

Lothar Knuf
Bernhard Hommel

Max Planck Institute for Psychological Research, Leopoldstraße 24, D-80802 Munich, Germany

[PII-40] Role of visuospatial working memory and spatial representation in way-finding.

Francesca Pazzaglia
Rossana De Beni

Until now a number of studies has found a wide range of individual differences in spatial representation (Weisman, 1981; Hirtle & Hudson, 1991; Montello & Pick, 1993; Lawton, 1994; 1996). The first goal of the present study was to demonstrate that individuals with a preference for survey representation of space (high-survey individuals) performed better than low-survey individuals on tasks that require to adopt spatial strategies, such as the Mental Rotation Test (Vanderberg & Kuse, 1978). Furthermore, we intended to demonstrate that high- and low-survey individuals differed in performing a way-finding task under different instructions. Two groups of high- and low-survey undergraduate students were selected on the base of their answers to the "Questionnaire on spatial representation and sense of direction" (Pazzaglia, Cornoldi & De Beni, 1999), and were administered with a number of visuospatial tasks. The two groups also performed two way-finding tasks, under different conditions (map and verbal description conditions). We expected that each group performed better under the condition closer to their preference, that is map for high-survey group and verbal description for low-survey group. Results confirmed our hypotheses and supported the existence of a relationship between visuospatial working memory, preference for survey spatial representations and wayfinding tasks.

Department of General Psychology, University of Padova, Via Venezia 8, I-35131 Padova, Italy

[PII-41] Localization tasks and visuospatial short-term memory.

The recall of 6 sequentially presented spatial localizations was investigated using two different reference spaces: (1) a 6 × 6 square matrix vs (2) a 8 × 8 square matrix. In accordance with our previous results, the performance was better when spatial localizations were neighbours than when they were distant. Moreover the performance levels were identical whatever the reference space size was (36 vs 62 cases). If we suppose that the subjects are able to identify a "useful space" matrix (i.e., the cases of the minimal rectangular matrix where the target cases and the cases crossed by the path between the successive cases), the greater recall of neighbour localizations could only reflect the subjects' greater probability to give six correct answers out of x possibilities than from y, when x is smaller than y (x and y correspond to the number of cases of the "useful space" matrix). The subjects behave as if they were able to minimize the response area independently of the presented reference space.

Jean-Marie Reymond

Jean-Luc Roulin

Laboratoire de Psychologie Expérimentale (CNRS EP617), Université de Savoie, B.P. 1104, F-73011 Chambéry Cedex, France

[PII-42] Organizing principle in blind and sighted children's drawings of embedded geometric shapes.

Sandrine Russier
Annie Magnan

Many authors have described graphic behavior in terms of a grammar of action that involves rules for sequencing movements (Goodnow & Levine, 1973; Millar, 1990; Thomassen, Meulenbroek & Hoofs, 1992) Magnan et al. (1997; 1999) have suggested that it is possible to widen this perspective on syntactic aspects of the drawing by considering how the execution of drawings of embedded geometric shapes is organised.They have shown that the children begin their drawing with the external element ("centripetal principle") for the copy. Here, we compare blind and sighted children aged 6–8 attempting to draw geometric shape. A raised-line drawing described as geometrical shape was shown tactually to the blind and visually to the sighted. We study the role played by the mental representation in the organization and control of execution. We suggest that this "centripetal principle" of graphic production appears in visual and haptic control. The child explores the shape actively and copy them as accurately as possible. We analyse the exploratory process and the executive control for visual and tactual modalities. The similar executive skills in blind and sighted subjects is discussed in terms of a theory of tactile pictures (Heller, 1989; Edman, 1992; Kennedy, 1997).

Laboratory of Development and Handicap, University of Lumière, Lyon 2, 5 Avenue Pierre Mendès-France, F-69676 Bron cedex, France

[PII-43] Identifying spatial relations between objects in a scene.

The present study contains three experiments investigating the means by which observers identify spatial relations between objects in a scene. Certain theories on perception assume that spatial perception is not mediated by mental representations, while others assume it to be influenced by immediately preceding mental representations of the environment. Recent experiments (Sanocki & Epstein, 1997), using a priming paradigm, suggest that immediately prior experience can induce representations of spatial layout that facilitate the rapid spatial processing of pictures. The goal of the present experiments was to replicate the findings by Sanocki and Epstein and to rule out some alternative explanations. In the basic experiment, observers respond to line-drawings of scenes by indicating which of two critical objects was closer in the pictorial space. The images were preceded by different types of prime images without the critical objects. The results obtained by Sanocki and Epstein (1997) were replicated. However, evidence was found that the apparent priming of local spatial relations by a preceding global spatial layout, is at least partly explained by an attentional capture, due to the sudden appearance of the target objects in the scene.

Jos Thys
Filip Germeys
Géry d'Ydewalle

Department of Psychology, University of Leuven, Tiensestraat 102, B-3000 Leuven, Belgium

[PII-44] The "Corsi" task (visuo-spatial span) and working memory components: Methodological and theoretical issues.

Tomas Vecchi
Massimiliano Bardone
Stefano Rossi

The present study investigated the cognitive mechanisms underlying performance in the Corsi task (visuo-spatial span). This test is used to measure visuo-spatial abilities. However, performance in the Corsi task did not always correlate with other visuo-spatial measures, and neuropsychological investigations highlighted that a normal performance in this test could be associated with an impairment in other visuo-spatial tasks. In the series of experiments reported here, the Corsi test (both forward and backward) was associated with five types of interfering tasks: verbal, visuo-spatial, central functions, motor and numerical interference, as well as presented in a baseline condition. Moreover, following Corsi's own results indicating that the supraspan condition is more sensitive to visuo-spatial deficits, the relationship between span and supraspan procedures was also investigated. Though our results showed a role of visuo-spatial processes in the execution of this task, motor and central interference had a greater effect on performance, particularly in forward and backward span. Span and supraspan performances correlated in the backward but not in the forward condition. Results are discussed with reference to the assessment of visuo-spatial abilities as well as to the cognitive architecture of working memory.

Dipartimento di Psicologia Generale, Università di Padova, via Venezia 8, I-35131 Padova, Italy

[PII-45] Determinants of complexity in a sequential, visuo-spatial short-term memory task.

Task-immanent aspects of complexity determine performance in tasks that require short-term storage of sequential, visuo-spatial information. Using the Corsi-Block-Tapping Test (Milner, 1971) with a fixed amount of seven blocks per sequence, we were able to prove the existence of the following three factors of complexity in adults: 1) length (i.e., absolute length of sequence in mm), 2) crossings (i.e., number of crossings of an imagined path within the sequence) and 3) barriers (i.e., number of crossed blocks within the sequence). These results are discussed against the background of current working memory research. Our results can be interpreted as a general confirmation of recent findings regarding the separation of the visuo-spatial sketch-pad (VSSP) into two subsystems for visual and spatial information. Besides, our findings are dicussed in concern of an additional involvement of other components of the working memory model.

Christof Zoelch
Ruth Schumann-Hengsteler

Professur V Entwicklungs- und Pädagogische Psychologie, Katholische Universität Eichstätt, Ostenstraße 26–28, D-85071 Eichstätt, Germany

[PII-46] The rise of automaticity in accessing number magnitude.

Luisa Girelli
Daniela Lucangeli
Brian Butterworth

The aim of this study was to examine how and when children come to map Arabic numerals to numerosities and to trace the rise of automaticity of this association. To this purpose a numerical-Stroop paradigm was adopted consisting of two comparison tasks. First-graders, third-graders, fifth-graders and university students compared either numerical size or physical size of Arabic numerals varying along both dimensions. In the numerical comparison task, a size-congruity effect was found at all ages, even if the pattern of facilitation and interference was modulated by several factors among which the gradual refinement in numerical knowledge over the school-years. Critically, in physical comparison the size-congruity effect, determined by the mismatched between physical and numerical size, characterised older children's and adults' performance only. These findings strongly suggest that access to number meaning acquires autonomous properties over the course of skill acquisition. Thus, children's ability to manipulate and operate upon Arabic numerals precedes but does not imply the automatic processing of them. It is only after extensive practice with the arithmetical symbols that the magnitude they represent becomes such a salient dimension so as to exert an influence on whatever the task requirements.

Dipartimento di Psicologia, Università di Trieste, Via dell' università 7, I-34123 Trieste, Italy

[PII-47] The involvement of short-term memory in multi-digit additions: Evidence from a dual-task paradigm.

Since the end of the seventies, studies have been conducted to determine the components of short-term memory that are involved in the resolution of multi-digit operations. In the framework of Baddeley's model, the central executive as well as the two slave systems (phonological loop and visuo-spatial sketchpad) could be involved in the resolution of multi-digit calculations. Our previous studies showed an effect of the phonological length of operands on the resolution times of multi-digit additions (MDA). In the present experiments, we investigated how the resolution of MDA is affected by two concurrent tasks loading either the phonological loop (Experiment 1) or the visuo-spatial sketchpad (Experiment 2). The results of those experiments partly support the hypothesis of the involvement of the phonological loop in MDA.

Cathy Lemer
Jacqueline Leybaert
Alain Content

Free University of Brussels, Avenue F. D. Roosevelt 50, CP 191, B-1050 Brussels, Belgium

[PII-48] Children's strategies for the estimation of numerosity in a two-dimensional environment.

Koen Luwel
Lieven Verschaffel
Erik De Corte
Patrick Onghena

This study investigates the development of an adaptive strategy for the estimation of numerosity in a two-dimensional environment from the theoretical perspective of "strategy change" (Lemaire & Siegler, 1995). A simple estimation task was used in which 39 second graders and 30 sixth graders had to estimate different numerosities of colored blocks in rectangular grids of three different sizes. Generally speaking, this task allows for two distinct estimation procedures: either repeatedly adding estimations of groups of blocks (addition procedure) or subtracting the estimated number of empty squares from the total number of squares in the grid (subtraction procedure). A rational task analysis indicates that the most efficient estimation strategy consists of the adaptive use of both procedures, depending on the ratio of the blocks to the empty squares in the rectangular grid. Subjects' adaptive choices between different procedures were unravelled by analysing response times and error rates with Beem's (1995) segmentation model. Results indicated that for trials with large numerosities almost all children used the subtraction procedure, but the second graders applied it frequently in a defective manner. Moreover, many children seemed to apply a third estimation procedure besides the addition and the subtraction procedures, which we defined as "instantaneous guessing".

Center for Instructional Psychology and Technology, University of Leuven, Vesaliusstraat 2, B-3000 Leuven, Belgium

[PII-49] Do single and two-digit numbers make access to the same analogue magnitude scale?

Bert Reynvoet
Marc Brysbaert

Many theories about human number representation include an analogue magnitude scale. Still, there is little or no evidence whether this number line is the same for single-digit and two-digit numbers. For instance, the number-processing times reported by Brysbaert (1995) could be explained by two possible models: either as a function of number frequency and the logarithm of number magnitude or as a function of number frequency and an extra cost for the processing of two-digit numbers. In the experiment we report, a target between 5 and 15 was presented and had to be named as quickly as possible. The target was preceded by a prime that ranged between the target minus 3 to the target plus 3. Multiple regression analyses indicated that there was a significant effect of identity priming and a significant distance effect (RTs were faster when prime and target were close to each other). A more confined analysis (in which only couples with a cross-over between single and two-digit numbers were included; e.g., 9–10 and 11–10) indicated that there was no difference between trials in which the prime and target shared the same number of digits and trials in which prime and target had a different number of digits. Results are in line with Brysbaert's first model and contradict the possibility that there is an extra time cost involved in the processing of two-digit numbers.

Department of Experimental Psychology, University of Gent, Henri Dunantlaan 2, B-9000 Gent, Belgium

[PII-50] Arithmetic problem solving and memorization of number facts.

Catherine Thevenot

The aim of our study was to show that the accomplishment of an arithmetic operation would degrade the representation of the numbers used for the calculation. Indeed, we suppose that when an adult achieves an arithmetic operation, he doesn't retrieve automatically the result but, he works by decomposition. For example, to compute 37+28, 37 is decomposed in 30+7 and 28 in 20+8. Thus, the number's activation level decreases and, at the same time, the intermediate result's activation increases. In order to test this hypothesis, we proposed to participants to accomplish additions and substractions on the one hand and comparisons on the other hand. Then, we proposed a recognition task in which participants had to recognize the previously seen numbers. The results confirm our hypothesis: The recognition performances are weaker when participants have to accomplish an operation than a comparison.

LEAD-CNRS Université de Bourgogne, 6 boulevard Gabriel, F-21000 Dijon, France

[PII-51] Cognitive mechanisms in the distinctiveness effect.

Nathalie Bedoin

The encoding hypothesis suggests that incongruous information benefits best processing because it attracts attention, or because of many associations with contextual cues, or because of a wider variety of background knowledge necessary for interpretation. According to the retrieval hypothesis, it enjoys an advantage at the representation stage. Its memory trace is distinct from other traces because of the stimulus properties. In Experiment 1, sentences contained an agent, an action (consistent with the agent's ontological category but not with its basic level) and a complement for which only the encoding interpretation predicts a distinctiveness effect (DE). DE appeared for agent and action but not for complement recall, casting doubt on encoding interpretations. The hypotheses also diverge about accumulated unusual information. The encoding explanation predicts that enhanced strangeness would increase encoding and DE. According to retrieval hypothesis, the DE lays on an enriched representation based on inferences from the category (C2) elicited by the unusual action. An added information that is incongruent with this action may block inferences and suppress the DE (Boyer & Ramble, submitted). But another explanation is possible: increased strangeness makes the sentence so unfamiliar that it prevents from elaborating a representation. In Experiment 2, agents and incongruous actions were associated with unusual complements: half were incompatible with the agent, but allowed expectations (C2); half were compatible with the agent but incongruous with the elicited action (C2). Data confirmed the retrieval hypothesis.

Laboratory of Cognitive Psychology, University Lyon 2, 5 avenue Pierre Mendès-France, F-69676, Bron cedex, France

[PII-52] Learning of statistical structures in sequences of stimuli and reactions: Same or different mechanisms?

Claudia Bett-Martin
Joachim Hoffmann
Annette Moser

Sequential learning, as of late, has been predominantly investigated in the serial choice reaction task (SRT): individual stimuli are successively presented to the subjects to which they have to react as quickly as possible by different responses. In general, statistical structures in the sequence of stimuli and responses decrease reaction time, indicating sequential learning. Moreover, it has been shown that learning is caused as well by redundancies in the sequence of stimuli as in the sequence of responses. However, it is still at issue as to whether or not learning of stimulus and of response sequences are based on the same learning mechnism. In the present SRTs, cards from a common deck of cards were used as stimuli and pressing keys of a common keyboard were the respective responses. In three experiments the frequencies and the transitions (contiguity and contingency) of stimuli and responses were seperately varied. The results show that the statistical regularities in the sequence of responses have a much stronger impact on learning than the same statistical regularities in the sequence of stimuli. It is discussed whether or not the observed differences refer to different learning mechanisms for stimulus and response sequences and what mechanisms it may be.

Psychology III, University of Würzburg, Röntgenring 11, D-97070 Würzburg, Germany

[PII-53] Artificial grammar learning under time pressure.

Subjects asked to memorize letter strings generated by a finite-state grammar can subsequently categorize new exemplars as "grammatical" or "ungrammatical" despite exhibiting poor verbalizable knowledge of the rule system. A long standing issue in this field has been to determine whether subjects' grammaticality decisions are based on similarity to stored exemplars, on abstract knowledge of the grammar, or on memorized chunks. Most studies have suggested that all these factors may influence performance. Based on the hypothesis that sensitivity to these different aspects of the letter strings may require different amounts of processing time to develop and start influencing decisions, we asked subjects to perform the classification task under three different deadline conditions (1200 msec, 2500 msec, or unlimited), and on four different types of test items obtained by crossing grammaticality and overall similarity with the training set. Similarity was assessed by means of Meulemans and Vanderlinden (1997)'s associative chunk strength measure, that is, the extent to which novel strings share bigrams and trigrams with the training set. A control condition in which subjects performed the classification without prior memorization of training items was also included.

Maud Boyer

Axel Cleeremans

Cognitive Science Research Unit, Université Libre de Bruxelles, Avenue F. D. Roosevelt 50, ULB CP122, B-1050 Brussels, Belgium

[PII-54] Activation spreading in taxonomic structures: The central position of basic-level concepts.

Jean Costermans

Natural taxonomies were build, composed of one general concept, two subordinate basic-level concepts differing in typicality, and two specific concepts. One item of each taxonomy was included in an incidental learning task. Then, in a recognition test, this item was replaced by the four other items of its taxonomy and false recognitions are registered. Upward shifts (from more specific to more general) were more often observed than downward shifts. Moreover, shifting downwards from general level to (typical) basic-level items proved to be more common than shifting from basic level to specific level. Similar conclusions were drawn from a second study using a semantic word association procedure. These observations were interpreted in the frame of a distributed model of semantic memory.

Department of Experimental Psychology, University of Louvain, Place du Cardinal Mercier 10, B-1348 Louvain-la-Neuve, Belgium

[PII-55] Ontological organisation in the distinctiveness effect.

Sandrine Honoré
Pascal Boyer
Nathalie Bedoin

Distinctiveness effects (DE) for semantic incongruities can be explained in either one of two ways: unusual information is better recalled because of deeper processing (encoding explanation) or because of properties of representations (retrieval explanation). The latter would predict that the DE in within-list designs disappears in between-list designs. This is supported by the results of Experiments 1a and 1b. Also, we found no difference in reading time between common and unusual sentences. This confirms that the DE occurs at the representation or retrieval stage, not at encoding. The hypotheses lead to different predictions for material of increasing oddity: according to the encoding hypothesis, high oddity should enhance processing and increase the DE ("monotonic" explanation); according to the retrieval hypothesis, DE would depend on the accordance of the additional oddity with the ontological category ("non-monotonic" explanation). In Experiment 2, the unusual aspect was not only unfamiliar (possibly suitable, as in Experiment 1), but also impossible for the agent's ontological category. No DE was obtained in a between-list design (Experiment 2a), nor in a within-list design (Experiment 2b). Contrasted data in Experiments 1b and 2b is not compatible with the classical "expectation-violation" interpretation of the DE, nor with the "monotonic" explanation, but supports the retrieval explanation. Very strange sentences demonstrate the DE in case of incongruity respective to basic-level (Bedoin-ESCOP) or when further information reinforce unusual aspects (Boyer & Ramble, submitted). Experiment 3 tests if ontologically incompatible information elicits a DE when followed by a paraphrase.

Cognitive Psychology Laboratory, Lumière University, Lyon, 5 avenue Pierre Mendès-France, F-69676 Bron cedex, France

[PII-56] Cognitive determinants of political beliefs.

Malgorzata Kossowska

The present study is concerned with the relationships between cognitive functioning and ideology. One important focus of this work has been on cognitive style constructs such as flexibility-rigidity and need for closure (Webster & Kruglanski, 1994). The main question in this study has been as follows: Do persons who differ in their characteristic ways of conceptually organizing their environments (need for closure) also differ in their receptiveness to particular political movements or ideologies? On the other hand, we hypothesised that cognitive rigidity, understood as the characteristic feature of the cognitive system, can be seen as the basic cognitive mechanism determining people's attitudes towards politics. One hundred and fifty adult persons participated in this study. Several methods were applied to measure ideological preferences (among others conservatism and authoritarianism) and cognitive style (Need for Closure Scale by Webster & Kruglanski, 1994). A computerised version of elementary cognitive task (SEEP, by Kossowska, 1998) was used to assess the level of cognitive rigidity. The results confirm the significance of the need for closure construct for formulating political beliefs. On the other hand, the results indicated that cognitive rigidity can be seen as the elementary mechanism underlying both need for closure and political beliefs.

Institute of Psychology, Jagiellonian University, ul. Golebia 13, PL-31 007 Krakow, Poland

[PII-57] Nim game strategies in 9-, 10- and 11-year olds.

A special software, created by our team, enables us to keep track of all the subject-computer interactions while this subject is playing a strategy game against the computer. The software is conceived in such a way that subjects have the impression to be confronted with a good but not perfect player. The experimental setting foresees 10 starting situations of increasing complexity. The subject receives an automatic feedback immediately after each game and he has the possibility to replay this game or to see again a feedback already seen. The 10 situations are presented in such a way that it is always possible to reduce a given situation to a simpler winning one seen previously. The present paper investigates the type of strategy used by the subjects: do they play in such a way that they indeed reduce the complexity? Do they actually use the feedbacks they receive? Is there a significant difference between the 9-, 10- and 11-year olds' strategies? Is there a difference in strategy associated to other cognitive tests?

Francis Lowenthal

Cognitive Sciences, University of Mons, Place du Parc 20, B-7000 Mons, Belgium

[PII-58] Cognitive observations in a Logo problem solving environment.

Corinne Marcourt

This poster is devoted to a clinical analysis of the cognitive strategies used by subjects while they were solving problems in a Logo environment. 140 dyads of 9- to 12 year olds were observed during one school year. The technique used is based on the "observing computer" approach: this technique assigns a double task to the computer wich serves simultaneously as information provider and as information gatherer. In order to organize our observations and help us to analyse the data, we created a "hierarchy". This hierarchy based on the complexity of the production of the dyads is presented in this poster. A first organization of the data and the types of solving processes most often encountered are also analyzed. The evolution of the strategies used by dyads are also compared. The results of this study underline the relevance of a multilinear and contextual conception of knowledge development: the type of strategy used by our subjects varies during the observation. Our subjects do not use systematically the highest level of cognitive operation which they can use: they adjust in a simple fashion their level of cognitive functioning to the nature and complexity of the situation and problem they encounter.

Sciences Cognitives, Université de Mons-Hainaut, 18, place du parc, B-7000 Mons, Belgium

[PII-59] Transformation knowledge: Influences on the flexibility of its use.

Transformations consist of inputs, operators, and outputs. Knowledge about transformations is important for all forms of goal directed behaviour (e.g., problem solving). The current investigation is concerned with the influence of familiarity with the domain, practice level, and task goal on the flexibility of using transformation knowledge. In a between-subjects design, 48 students either had to practice symbolic transformations or alphabet-arithmetic tasks. Symbolic transformations should be unfamiliar to participants, whereas alphabet-arithmetic tasks involve knowledge that should be familiar to them. Practice level varied between one and two sessions. The application of any of four different operators within each domain was either practised by specifying the inputs for given information about operator and outputs or by specifying the outputs for given information about operator and inputs. After practising the transformation tasks, a test was run in a Yes/No-paradigm requiring to verify complete examples of transformations. To test the flexibility of knowledge use, the complete examples were either primed by information about operator and input or by information about operator and output. The prime times were 2000 ms for symbol transformations and 500 ms for alphabet-arithmetic tasks. Implications of the results for the mental representation of transformation knowledge will be discussed.

Burkhard Müller

Department of General Psychology, University of Giessen, Otto-Behaghel Straße 10, D-35394 Giessen, Germany

[PII-60] Effect of species and group size context on subjects' risk attitudes in a 'life-death' decision problem.

Frédéric Simons
Serge Bredart

This study examines the effects of species and group size context on subjects' risk attitudes and their sensitivity to the framing of choice outcomes in a 'life-death' decision problem. Wang and Johnston's study (1995) revealed that subjects' risk preferences varied as a function of the experimental manipulation: previously observed preference reversals (framing effects) appeared only in large-group contexts and disappeared in small-group and family context. These results were interpreted as reflecting a domain-specific choice mechanism designed to solve evolutionary recurrent and adaptively important problems. We hypothesized that the framing effect in large groups can be due to the lack of credibility of the problem. The life-death problem was presented in three large group contexts involving either the whole human population, a whole alien (lesser credibility) population and the whole whale population (higher credibility). The framing effect was present only for the whales and the human problems. The whales problem elicited more deterministic responses in both framing conditions. These data suggest that the observed effect was a large group rather than a large number effect and that subjects felt more concerned by humans than by whales.

Cognitive Psychology Unit, University of Liège, Boulevard du Rectorat 5, B32, B-4000 Liège, Belgium

[PII-61] Analogical problem solving and the aid of visual displays.

Ilse M. Verstijnen
Johan Wagemans

In studies of analogical problem solving the analogical transfer from the source problem to the target problem has been found to be extremely difficult. In this area the Duncker radiation problem (Duncker, 1945) is extensively studied. Gick and Holyoak (1983) investigated whether accompanying the source with a visual display representing the underlying structure would improve the amount of analogical transfer. They found this not to be the case. Beveridge and Perkins (1987) repeated this investigation with more elaborate displays; they instead found these displays to improve the amount of transfer. Both studies, however, used novices in the domain of radiation in their studies. It can be the case that experts in the radiation domain may have profited from the more abstract displays of Gick and Holyoak, since experts are known to have more abstract representations of a domain. This hypothesis is currently being investigated. Advanced students in architecture are compared to psychology students on both the radiation problem and a newly created architectural problem. Since the former students are also advanced paper and pencil sketchers, it will also be investigate whether they can create helpful displays themselves. Our poster will report on the outcome of these studies.

Department of Psychology, University of Leuven, Tiensestraat 102, B-3000 Leuven, Belgium

[PII-62] Hemispheric specialization and identification of words: influence of the perceptive indices

Rose Pira-Menconi
Jean-Louis
Juan de Mendoza

This research is based on the assumption that right hemisphere processes and codes in memory the low level perceptive indices (such as the word-shape, typography and the length of words) while the linguistic indices (word meanings and grammatical category) are treated by the left hemisphere. To test this assumption, we used a lateralized presentation, words and pseudo words (9 letters), in lower case (e.g.: mécanicien) and alternate typography (e.g.: MéCaNiCiEn) In this research, two techniques were used: First, a lexical decision task (divided hemifield tachitoscopic presentation). The first result shows that the error rate ('yes': it's a word, 'no': it is not a word) is lower when the word, whatever its typography, is presented in the right part of visual field (initially processed by the left hemisphere). On the contrary, the error rate is lower when the pseudo- word is presented in alternate typography in the left part of the visual field (initially processed by the right hemisphere). Secondly, the eye movements tracking experiment confirmed the results obtained in the lexical decision task. The results are discussed within the framework of current findings and theories, as supporting asymmetric processing in the two hemispheres.

Laboratoire de Psychologie Expérimentale et Quantitative, Pole Universitaire Saint Jean d'Angely, 24 avenue des Diables Bleus, 06357 Nice Cedex 4, France

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