

VII Dubrovnik Conference on Cognitive Science
DUBROVNIK, 21-23 MAY, 2015.

Metacognition and Reasoning



Invited Speakers:

Klaus Fiedler, Asher Koriat, Joelle Proust,
Nicholas Shea, Valerie Thompson, Maggie Toplak

Chairs:

Balázs Aczél, Olivier Mascaró

Organizers:

Csaba Pléh, Nevena Padovan, Dora Kampis
Barnabás Szászi, Aba Szóllósi, Bence Pálfi

Centre for Advanced Academic Studies (CAAS) Dubrovnik
University of Zagreb



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Programme

Thursday, May 21:

- 17:00–19:00 Registration
15:30–18:30 Tobii Pro pre-conference workshop
19:00 Welcome Reception

Friday, May 22:

- 8:00–9:00 Registration
9:00–10:00 **Invited talk: *Valerie Thompson***
Intuition, Analytic Thinking, and the Feeling of Rightness: A
Metacognitive Reasoning Theory
10:00–10:30 Coffee break
10:30–11:30 **Poster session 1**
11:30–12:30 **Invited talk: *Klaus Fiedler***
Metacognitive myopia - a major impediment of rational
behavior
12:30–14:30 Lunch
14:30–15:30 **Poster session 2**
15:30–16:00 Coffee break
16:00–17:00 **Invited talk: *Nicholas Shea***
Metacognition of Concepts
17:00– Social programme

Saturday, May 23:

- 9:00–10:00 **Invited talk: *Maggie Toplak***
The development of rational thinking and decision making
in children and youth
- 10:00–10:30 Coffee break
- 10:30–11:30 **Poster session 3**
- 11:30–12:30 **Paper session (3 presentations)**
- 12:30–14:30 Lunch
- 14:30–15:30 **Invited talk: *Joelle Proust***
Metacognition from a dual-process viewpoint
- 15:30–16:00 Coffee break
- 16:00–17:00 **Invited talk: *Asher Koriat***
How do we monitor the correctness of our knowledge and
judgments? The bases and accuracy of subjective
confidence
- 17:00–18:00 Roundtable
- 18:00–18:15 Assembly meeting
- 18:15–18:30 Closing words & Farewell reception
- 20:00– Social programme

Friday (May 22), 9:00–10:00

Abstracts - Invited speakers

INTUITION, ANALYTIC THINKING, AND THE FEELING OF RIGHTNESS: A METACOGNITIVE REASONING THEORY

*Valerie Thompson,
University of Saskatchewan*

Amongst educators and psychologists, questions of metacognition have garnered much attention, especially as they pertain to the domains of learning and memory. In this context, it is therefore somewhat surprising that relatively little is known about the cognitive processes involved in the monitoring and control of reasoning and problem-solving. That is, we know little about how reasoners assess their confidence in their conclusions, how this confidence influences subsequent behaviour, nor how reasoning performance is assessed on an ongoing basis. In this talk, I will outline a theory of metareasoning that draws on insights from the learning and memory literature, extending them to a variety of common reasoning tasks. Data will be presented to suggest that monitoring is inferential and based on cues such as the fluency with which answers are brought to mind. Monitoring is proposed to be a continuous processes, and the relationship between monitoring and control processes will be explicated. In addition to corroborating links between the metatmemory and the nascent field of metareasoning, I will also provide evidence that study of metareasoning provides novel insights about both metacognition and reasoning.

Friday (May 22), 11:30–12:30

METACOGNITIVE MYOPIA - A MAJOR IMPEDIMENT OF RATIONAL BEHAVIOR

Klaus Fiedler

Ruprecht-Karls-Universität Heidelberg

What I have come to call “meta-cognitive myopia” (MM), using a term once suggested by Robyn Dawes, is the phenomenon that people are pretty accurate in utilizing even large amounts of stimulus information. However, they are uncritical and naïve regarding the history and validity of the given information samples. This uncritical reliance on the information given is most conspicuous when the task context makes it crystal-clear that the stimulus data should not be trusted. I locate MM within a broader framework of meta-cognition research and illustrate the phenomenon with examples from various research paradigms. MM offers an alternative account of many biases in judgment and decision making, which have been traditionally explained in terms of capacity constraints, limited reasoning ability, motivational forces, or severely biased environmental input. The explanatory power of the MM construct, and its theoretical potential to predict new findings, is demonstrated with reference to five paradigms: inability to discard irrelevant information; utilization of selectively sampled information; conditional inference biases; sample-size neglect; and myopia for the impact of aggregation levels. The final discussion is concerned with the learning origins of MM and the question of why evolution did not equip homo sapiens with more effective meta-cognitive tools. An analysis of the costs and benefits will reveal that MM may serve important adaptive functions, and that eliminating MM may have maladaptive effects. Nevertheless, in the context of many real decision problems, the costs and irrational consequences of MM cannot be denied. The final discussion therefore focuses on possible ways to avoid and alleviate MM and its irrational consequences.

METACOGNITION OF CONCEPTS

*Nicholas Shea
King's College London*

Concepts are the constituents of thought and underpin much personal level reasoning. They also allow us to ‘project’ properties we have learnt about one object to new objects. For example, I might interact with something I have classified under my CAT concept and learn that it purrs when stroked. When subsequently encountering another object that is classified under CAT I can form the expectation that it will purr if stroked. Reasoning and ‘projection’ are two core uses of concepts.

Some concepts are more dependable than others for these purposes. This paper will suggest that thinkers often make use of a sense of how dependable their concepts are. Such ‘feelings of dependability’ are not explicit higher order beliefs about a concept, but a form of what has been called ‘procedural metacognition’ (Proust 2013 *The Philosophy of Metacognition*). Metacognition has been studied in relation to many cognitive processes, prominently memory and decision making, but it is little-studied in relation to concepts. This paper makes a prima facie case that there metacognition of concepts, in the form of a non-conceptual representation or feeling of dependability that is associated with the use of many concepts. It goes on to explore some philosophical applications of the idea that there is metacognition of concepts.

**THE DEVELOPMENT OF RATIONAL THINKING AND DECISION MAKING IN CHILDREN
AND YOUTH**

Maggie Toplak
York University

Many cognitive abilities show a steady increase throughout childhood and adolescence, but this is not necessarily accompanied by better rational thinking performance on several heuristics and biases tasks. Previous research has found that some rational thinking skills show improvement with age, but others do not (Davidson, 1995; Jacobs & Potenza, 1991; Klaczynski, 2005; Morsanyi & Handley, 2008; Reyna & Farley, 2006; Reyna et al., 2006). Likewise, our research group has found that some measures of rational thinking performance are associated with cognitive ability in adults, and some are not (Stanovich & West, 2008). We have used a taxonomy of rational thinking tasks that predicts which rational thinking tasks will associate with development and cognitive ability (Stanovich, West, & Toplak, 2011). Our taxonomy predicts that only tasks necessitating cognitive decoupling and analytic override will be significantly associated with cognitive ability and development. We have examined performance on several rational thinking tasks (probabilistic choice, belief bias syllogisms, resistance to framing, base rate sensitivity, and otherside thinking) and measures of cognitive ability (intellectual abilities and executive functions) in a sample of children (N=204) aged 8-14 years of age (Toplak, West, & Stanovich, 2014). Developmental differences were found on our rational thinking tasks and associations with cognitive ability were consistent with these developmental patterns. These findings suggest that rational thinking tasks which require analytic override show significant correlations with cognitive abilities as well as developmental trends. This research contributes to clarifying previous developmental results on heuristics and biases tasks that appeared to suggest inconsistent developmental trends.

Saturday (May 23), 14:30–15:30

**THE DEVELOPMENT OF RATIONAL THINKING AND DECISION MAKING IN CHILDREN
AND YOUTH**

Joëlle Proust

Jean Nicod Institute, CNRS, Paris

There is ample evidence favoring a dual-processing conception of metacognition, which contrasts Type 1 processes –activity-dependent, implicit, fast, automatic, and inflexible -, with Type 2 processes - activity-independent, explicit, slow, controlled, and flexible. This contrast, however descriptively adequate, calls for an explanatory account. The evolutionary pattern of metacognition, the prominent role, in humans, of epistemic decision at various time scales and resource levels, and the contrast between associative and inferential cognition point to the engagement of two different representational systems in human metacognition. While System 1 is based on relational, subjective, evaluative non-propositional attitudes, System 2 consists in referential, objective, propositional attitudes, tailored to meet the needs of linguistic communication. As a consequence of this representational difference, System 1 can be sensitive to the fluency or effort involved in a cognitive task and predict its likely correction on this basis. It is not equipped, however, to identify what makes any specific content true or false. System 2, which can reflectively deal with reasons, cannot swiftly evaluate or predict correctness of its outputs. To be fully functional, metacognition must, then, be able to use both systems jointly, in a context-sensitive way. How is this cooperation at all possible? We will attempt to articulate a tentative solution to this question, based on a threetiered theory of cognitive action, consonant with Rolf Reber's recent proposal, in which noetic habits, strategically trained and monitored, become able to trigger System 1 evaluations.

Saturday (May 23), 16:00–17:00

HOW DO WE MONITOR THE CORRECTNESS OF OUR KNOWLEDGE AND JUDGMENTS? THE BASES AND ACCURACY OF SUBJECTIVE CONFIDENCE

Asher Koriat
University of Haifa

People take the validity of their confidence judgments for granted and use these judgments to guide their behavior. But how valid are subjective convictions, and what are the reasons for their validity? A Self-Consistency Model (SCM) will be presented for the basis of confidence judgments and their accuracy. SCM assumes that the process underlying subjective confidence has much in common with that underlying statistical inference about the outside world. Participants behave like intuitive statisticians who attempt to reach a conclusion about a population on the basis of a small sample of observations. When asked to decide between two answers, they retrieve a small sample of clues and considerations from memory, and their confidence in their decision represents an assessment of reproducibility -- the likelihood that a new sample of clues will yield the same decision. The results indicate that metacognitive accuracy is a by-product of cognitive accuracy: The confidence/accuracy correlation is positive only because this correlation has been studied under conditions in which people' cognitive performance is largely correct, but is negative when people are largely in error. Results consistent with the model were obtained across many domains, and the theory has proved yielded novel predictions for several areas such as the effects of social influence, individual vs. group decisions, and the wisdom-of-crowd phenomenon.

Saturday (May 23), 11:30–12:30

Abstracts – Paper session

RESPONSE CARDINALITY INDIRECTLY REDUCES CONFIDENCE

Simon A Jackson, University of Sydney, Australia

Koriat's self-consistency model of subjective confidence (SCM) proposes that the consistency and accessibility with which a response is retrieved from memory are cues to confidence in the accuracy of that response. SCM, however, has only been assessed using two-alternative forced-choice questions. Consideration of open-ended questions suggested that response cardinality, the number of unique response options that might come to mind, should directly reduce response consistency, and thus indirectly reduce confidence. Australian undergraduate students (N = 389) completed a 20-item open-ended general-knowledge test with confidence ratings attached to each answer. Replicating previous SCM findings, but in an open-ended format for the first time, consistency and accessibility were independent positive predictors of confidence. Extending the model, the number of unique responses given by participants, a measure of response cardinality, was found to be a strong negative predictor of consistency and an indirect negative predictor of confidence. Implications of the results therefore include the use of simple strategies such as prompting or providing varying numbers of response options as potentially effective for manipulating cardinality and thus confidence.

Saturday (May 23), 11:30–12:30

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THE ACCURACY OF METACOGNITIVE JUDGMENTS IN SYLLOGISTIC REASONING

Igor Bajšanski, University of Rijeka, Croatia;

Maja Močibob, University of Rijeka, Croatia;

Pavle Valerjev, University of Zadar, Croatia

In this study we explored the basis of metacognitive judgments in syllogistic reasoning. In three experiments, the participants made different types of metacognitive judgments: confidence judgments, judgments of performance and judgments of task difficulty. The confidence judgments were made after producing a conclusion that logically followed from the given premises and after choosing the conclusion from a list of choices. Judgments of performance were made after a quick overview of a problem. Judgments of difficulty were made before and after solving syllogistic problems. A total of 166 psychology students participated in the experiments. In all three experiments, participants were generally overconfident. The relative accuracy of judgments was low. The analysis by items revealed positive correlations between different metacognitive judgments but lower correlations between judgments and reasoning accuracy, and negative correlations between metacognitive judgments and response times. The final analysis revealed the strong effect of answer consensuality on metacognitive judgments: metacognitive judgments were higher for consensual than for non-consensual answers, regardless of their accuracy. The results indicate that reasoners, instead of monitoring their actual performance, rely on different type of cues while making metacognitive judgments.

Key words: metacognition, syllogistic reasoning, judgment accuracy, answer consensuality

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DETERMINANTS OF CONFIDENCE IN THE BAT AND BALL PROBLEM

Aba Szollosi, Eotvos Lorand University;
Barnabas Szaszi, Eotvos Lorand University;
Balazs Aczel, Eotvos Lorand University

Decision-confidence differences between conflict and non-conflict versions of several reasoning tasks gave rise to the claim of an intuitive logical process that proposes people implicitly detects conflict between the correct and their heuristic answers. Interestingly, the effect also appeared on the popular Bat and Ball Problem. In two empirical studies we tested whether implicit conflict detection has any effect on decision confidence in the Bat and Ball Problem. Verbal measures did not reveal significant effect of implicit processes between the conflict and non-conflict versions of the task. A hierarchical regression analysis revealed that the verification of the operation and the perceived verifiability of the task significantly predicted confidence, however, the significant predicting power of accuracy raises questions about the validity of the paradigm.

Key words: metacognition, decision-confidence, CRT, bat and ball problem, conflict detection

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Poster sessions

Poster Session 1.: Friday, May 22, 10:30–11:30

Meditative Choice is a Good Choice: Connecting Mindfulness, Decision Making, and Emotions

Christopher Anderson, Steven Jay Lynn

Better memory improvement after a JOL than after relearning: an effect of retrieval attempt when monitoring knowledge?

Elisabeth Bacon, Marie Izaute, Elisabeth Bacon

Great apes understand others' beliefs in an interactive task

Frances Buttelmann, Malinda Carpenter, Josep Call, Michael Tomasello

What is the best measure of unpredictability for morphological segmentation?

Daniel Czégel, Csaba Pléh

Measuring mindfulness with behavioral assessments

Denke Diana, Monika Albu, Mate Szondy

Interaction between Numbers and Their Quantities for Small Magnitudes

Dražen Domijan, Mia Šetić

The unsmart infant: language comprehension depends on contextual and situational cues in 9-month-old infants

Bálint Forgács, Eugenio Parise, Gergely Csibra

The impact of social cues on metacognitive judgments across cultures

Amelie Jacquot, Julie Grézes, Terry Eskenazi, Edith Sales-Vuillemin, Mika Ueno, Shoji Itakura, Joëlle Proust, Laurence Conty

Metacognitive skill-development in Medical Education: A Pilot Study Considering Philosophical Tools of Thinking

Basak Kocaoglu, Cetin Balanuye, Yesim Senol

Tracking social agents' mental states modulates action preparedness in adults

Ágnes Kovács, Ernő Téglás

Friday (May 22), 10:30–11:30

Self-reported preferred thinking style and cognitive reflection

Eva Ballová Mikušková, Vladimíra Čavojová, Róbert Hanák

Congruency sequence effect in the ratio bias paradigm

Bence Pálfi, Zoltan Kekecs, Balazs Aczel

Ostensive-Referential Communication Fosters the Interpretation of Pictures of Objects as Symbols of their own Kind in 9-Month-Old Infants

Eugenio Parise, Gergely Csibra

The effects of script based schemes on retrieval of novel events

Anett Ragó, Dávid Szabolcsi, Bence Szekeres-Gaál

The effects of valence and images on the source monitoring

Frédérique Robin

How likely is it that Snakes are not Reptiles? A ‘new paradigm’ approach to Belief Bias.

Edward Stupple

Enhancing neural excitability of the right vs. left prefrontal cortex differentially affects consolidation of implicit statistical learning

Csenge Török, Kata Horváth, Karolina Janacsek, Andrea Antal, Dezso Nemeth

Moral reasoning among adolescents and elderly– a group study

Andrea Turner, Judit Páli

In which box does this number go? Breaking down the number categorization task.

Arnaud Viarouge, Véronique Izard

Poster Session 2.: Friday, May 22, 14:30–15:30

An integrative metacognitive model of mindfulness

Mónika Albu, Szondy Máté, Diana Denke

Interference and priming in spontaneous belief computation

Gábor Bródy, Ildikó Király, Ágnes Kovács

Machine Learning for the Estimation of UPDRS score

Krisztina Búza

A Holistic Theory on the Development of Cognitive Biases in Real-Life Decisions

Marcus Domeier, Pierre Sachse

Psycholinguistic analysis of conjunction in Croatian

Margarita Draganić, Marijan Palmović

Evidence for spontaneous level-2 perspective taking in adults

Fruzsina Elekes, Máté Varga, Ildikó Király

Conscious monitoring of emotion perception: evidence from attentional blink

Kamil Fulawka, Remigiusz Szczepanowski

Impact of semantic encoding effects on arithmetic problems in sorting and solving tasks

Hippolyte Gros, Emmanuel Sander, Jean-Pierre Thibaut

Coordinated Reasoning

Justin Jacot

Is belief re-computation by retrieval available for young children?

Ildikó Király, Kata Oláh, Ágnes Melinda Kovács, Gergely Csibra

The domain-generalty of working memory: A matter of ability

Kristof Kovacs, Dylan Molenaar, Andrew Conway

"But I was there!" - episodic memory as a mechanism for justification

Johannes Mahr, Reka Peto, Gergely Csibra

Oxytocin modulates social categorization processes

Katalin Oláh, József Topál

Friday (May 22), 14:30–15:30

Pragmatic aspects of reasoning in real life situations

Marina Olujić, Gordana Hržica, Marijan Palmović, Marina Olujić, Nevena Padovan

Behavioral task as tool for short-term verbal memory and cognitive vulnerability to depression assessment in mesial temporal lobe epilepsy

Lidija Preglej, Dražen Domijan, Daniel Crnković, Ksenija Marinković, Hrvoje Hećimović

Metamemory in educational psychology

Marta Riess

The role of executive functions in patients with aphasia

Izabella Szöllősi, Ágnes Lukács, Lilla Zakarias

A comparison of possession comprehension in children with typical language development and children with specific language impairments using E-prime

Ivona Radić Tatar, Paulina Mataija, Martina Vuković Ogrizek, Rafaela Martić, Marina Paprika

Deductive problem solving and learning logic

Mariusz Urbański, Katarzyna Paluszkiewicz, Joanna Urbańska

Clinical Gut: The role of inferential direction on psychotherapist's metacognitive confidence and need for more information

Jacinto Sofia, Ferreira Mário, Braga João

Individual differences in state-dependent decision making depend on cognition, and metacognitive monitoring and control

Simon A Jackson, Sabina Kleitman,

Poster Session 3.: Saturday, May 23, 10:30–11:30

Solvable or Not Solvable? Heuristic Cues that Underlie the Judgment of Solvability

Rakefet Ackerman, Yael Beller

Assessment of Non-Native Speakers' Metacognitive Abilities and Reasoning Stem from Rational Thinking to Adopt a New Template of Language Grammatical Aspects: Evidence from MEG and fMRI

Sadeq Ali Saad Al Yaari

Overcoming intuitive interference in geometry: from brain studies to an educational intervention

Reuven Babai, Enav Shalev, Ruth Stavvy

Contaminated mindware and reflective mind

Vladimira Čavojová, Róbert Hanák, Eva Ballová Mikušková

The impact of social context on children's executive functioning and its relationship to creativity

Paula Fischer, Nicolas Chevalier, Mark A. Runco

Representing others' beliefs about object identity in 14 month-old infants

Dora Kampis, Ágnes Melinda Kovács

Metacognition and performance rating in spatial manipulation tasks

Roland Kasek, Szabolcs Takács, Mónika Albu

Negative numbers in elementary school

Orsolya Kiss, Krajcsi Attila

Low cognitive load and reduced arousal impede practice effects on executive functioning, metacognitive confidence and decision making

Sabina Kleitman, Simon A Jackson, Eugene Aidman

The Source of the Distance Effect in an Artificial Number Sequence

Petia Kojouharova, Attila Krajcsi

The Trusting Twos: The epistemic weight attributed to communication increases during toddlerhood.

Olivier Mascaró, Ágnes Melinda Kovács

Saturday (May 23), 10:30–11:30

Is writing metarepresentational?

Olivier Morin

Affect and Metacognition: Confidence (in)Sensitivity When Feeling Happy

Yael Sidi, Rakefet Ackerman, Amir Erez

The Roles of Intention and Belief on Mood

Sabina Skubic, Alexander Batthyany

Metacognition at a collective level

Tobias Störzinger

On the cognitive biases as cognitive territories outside positive manifold continent

Predrag Teovanović, Lazar Stankov

The development of metacognitive monitoring-control processes in adolescence

Nike Tsalas, Markus Paulus, Beate Sodian

When problem solving meets metacognition: thinking about writing before doing it.

Rosa Volpe, Lucile Chanquoy

The Effect of Explicit and Implicit Category Learning on Classification Accuracy and Confidence

Valnea Žauhar, Igor Bajšanski, Dražen Domijan

Abstracts – Posters

Session 1

Meditative Choice is a Good Choice: Connecting Mindfulness, Decision Making, and Emotions

*Christopher J. Anderson, Union College, USA
Steven Jay Lynn, Binghamton University, SUNY, USA*

Mindfulness has recently shown much promise as an approach to improving physical and mental health, but little research has examined its role in decision making. We postulated that dispositional mindfulness and acceptance would be related to both decisiveness and positive emotions associated with decision making.

Using validated instruments, we tested 68 participants on a battery of relevant measures: Decisiveness, Regret, the Mindful Attention Awareness Scale, Subjective Well Being, Honest Responding (BIDR), the Behavioral Symptom Inventory, and an average Valence of cued autobiographical memories. The data were analyzed by multiple regression techniques to account for shared variance explained.

Statistically significant connections with strong effect sizes were found in the predicted domains as well as on some unexpected variables (e.g., people high in acceptance were very likely to respond honestly, but mindfulness had no relationship to honesty). The evidence suggests that research into training mindfulness and acceptance may reveal an effective, strong, and relatively inexpensive route for improving individual decision making.

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Better memory improvement after a JOL than after relearning: an effect of retrieval attempt when monitoring knowledge?

Elçin Akdoğan^{1,2}; Marie Izaute^{3,4}; Elisabeth Bacon^{1,2,5,6}.

1: Unistra (university of Strasbourg, France); 2: INSERM U-1114, Strasbourg; 3: Clermont-Ferrand Blaise Pascal University, France; 4: CNRS, UMR 6024, LAPSCO, Clermont Ferrand, France; 5: University Hospital of Strasbourg; 6: Fédération de médecine translationnelle, Strasbourg.

The most common learning method focuses on learning repetition, but is not very effective for long-term retention. More recently, the testing effect shows testing to be

more efficient than re-learning. On the other hand, when making a Judgment Of learning (JOL), people make a covert attempt to retrieve the answer, which can be regarded as a self-testing. Studies having explored the potential mnemonic benefit of repeated JOL have yielded ambiguous results. The aim of this study was to compare JOL with both testing and re-study conditions in a very plain experimental paradigm. After a single word-pair encoding phase, participants took part in a single session devoted to re-study, self-monitoring, or testing. The final cued recall test occurred 48 hours later. The strength of the cue-target association was manipulated. The results show no differences in performances for the easy word pairs. However, with the difficult material, the monitoring procedure produced comparable memory performance to testing procedure, and both yielded better levels of performance than re-study. Retrieval practice seems to underlie both strategies. JOL could be an alternative to the testing which could have more chance to be adopted.

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Great apes understand others; beliefs in an interactive task

Frances Buttellmann, Central European University, Hungary / University of Erfurt, Germany.

David Buttellmann, University of Erfurt, Germany

Malinda Carpenter, Max Planck Institute for Evolutionary Anthropology, Germany / University of St Andrews, United Kingdom

Josep Call, Max Planck Institute for Evolutionary Anthropology, Germany / University of St Andrews, United Kingdom

Michael Tomasello, Max Planck Institute for Evolutionary Anthropology, Germany

Thirty-four great apes “theory-of-mind” was investigated using an interactive helping task. An experimenter put an object at location A. An assistant transferred the object to location B, either in the experimenter’s absence (false-belief) or presence (true-belief condition). Afterwards the experimenter unsuccessfully tried to open box A. Subjects were then given the chance to help the experimenter open a box. To help appropriately, they had to infer the experimenter’s goal based on his beliefs: In the false-belief condition, he believed box A to contain his object, thus, he probably wanted his object. In the true-belief condition, in contrast, the experimenter knew that box A was empty. Thus, he was less likely to want his object when trying to open the empty box. Subjects correctly unlocked the box containing the object (box B) significantly more often in the false-belief than in the true-belief condition. In Study 2, the same subjects were tested

in a replication of the false-belief and in a new ignorance condition. Again, subjects unlocked the box containing the object significantly more often in the false-belief than

Friday (May 22), 10:30–11:30

in the ignorance condition. These studies provide first evidence that great apes understand others' false beliefs, challenging humans' uniqueness in this respect.

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What is the best measure of unpredictability for morphological segmentation?

Dániel Czégel, Budapest University of Technology and Economics, Hungary
Csaba Pléh, Central European University, Hungary

Morphological segmentation is a crucial part of language processing. It has been raised intuitively several times that the morpheme boundaries may correspond to a relative entropy increase in word forms.

A usual approach is to somehow quantify the unpredictability of the next or previous letter (or phoneme) in the text. An important point here is how to choose this unpredictability measure. In the literature, three main methods have been proposed: letter successor/predecessor variety (LSV/LPV), Shannon entropy (LSE/LPE), and max-drop (LSM/LPM).

In our work, all these three measures are generalized by using a one-parameter entropy measure called Rényi-entropy $S(q)$. Based on $S(q)$, morpheme boundaries are inferred in an unsupervised manner from the text. In order to investigate what unpredictability measure, parametrized by q , is the most applicable for this task, we evaluate our results by comparing it with grammatically segmented data from the Hungarian National Corpus containing about 200 million words.

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Measuring mindfulness with behavioral assessments

Diana Denke, KRE - Psychological Institute, Budapest, Hungary
Monika Albu, KRE - Psychological Institute, Budapest, Hungary
Mate Szondy KRE - Psychological Institute, Budapest, Hungary

Mindfulness techniques and related research have become more and more widespread in recent years. Most studies use self-report questionnaires to assess dispositional capacities of mindfulness and examine the efficiency of mindfulness-based trainings in the light of correlating psychological factors (mental health, emotional difficulties, and stress reactions). However validated behavioral assessments that would objectively measure mindfulness capabilities are rare to found. In our study two behavioral tests were developed for the above purpose.

First, results from a breath counting exercise have been found correlating with dispositional mindfulness (FFMQ, Baer et al. 2006) and separate from various indicators of working memory. Second, an exercise based on the Necker cube illusion was used as a behavioral assessment to measure cognitive flexibility and conscious presence. Various conditions of the Necker cube exercise have been found correlating with FFMQ variables and partly with indicators of working memory and executive functions.

Results of the study indicate that breath counting and Necker cube exercises could serve as behavioral tests to objectively measure mindfulness capacities.

Key words: Mindfulness, behavioral assessments, FFMQ
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Interaction between Numbers and Their Quantities for Small Magnitudes

Dražen Domijan, University of Rijeka, Croatia
Mia Šetić, Catholic University of Croatia, Croatia

In two experiments, we examined whether irrelevant numerical information can influence the speed of sentence-picture verification. Participants were asked to verify whether the concept mentioned in a sentence matched the shape of the object presented in a subsequent picture (concept-object match). Concurrently, the number attached to the concept in the sentence and the quantity of objects presented in the picture was manipulated (number-quantity match). The number of objects varied from one to four. In experiment 1, sixty-four statements were created: 32 statements which matched in shape and 32 did not match in shape with the subsequent picture presentation. Within each set, half of the statements also matched number with quantity and the other half did not, creating a 2 x 2 factorial design with concept-object match (yes vs. no) and number-quantity match (yes vs. no) as repeated measures factors. In experiment 2, the stimuli were full sentences. In both experiments, the verification times for concept-object match were faster when there was also a number-quantity match compared to mismatch. On the other hand, there was no difference between number-quantity match and mismatch when concept and object mismatched.

Key words: grounded cognition, numerical cognition, sentence-picture verification, Stroop interference
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Friday (May 22), 10:30–11:30

The unsmart infant: language comprehension depends on contextual and situational cues in 9-month-old infants

Bálint Forgács, Université Paris Descartes

Eugenio Parise, Lancaster University

Gergely Csibra, Central European University

A number of electrophysiological studies have reported that infants as young as 9 months of age exhibit the neural correlate of semantic comprehension, the N400 ERP component. These results seem to confirm the long-standing assumption that language comprehension is in place prior to language production. However, infants in this age seem to detect semantic incongruity only under specific conditions, for example, if words are produced by their mother (and not by an experimenter), or if they are engaged in an ostensive-referential live interaction. Such results suggest that 9-month-olds might understand words only if they hear them from a familiar voice, or if they are highly engaged. In an EEG experiment using a puppet theater presentation we aimed to explore whether infants understand words if they do not hear them from their mother, but merely if they are highly engaged. Our results brought no N400 effects, which indicates that 9-month-old infants might not treat language independent of situational and contextual aspects, and the identity of the speaker, or that phonological facilitation (the mother's voice) might be decisive in their comprehension capacities.

Key words: word acquisition, N400, infant development, language comprehension

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The impact of social cues on metacognitive judgments across cultures

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Metacognitive judgments refer to processes by which people assess their own cognitive operations. We showed that these judgments are susceptible to unreliable non-verbal social signals. Here, we tested whether such susceptibility varies as a function of individual's culture. Indeed, eastern cultures are usually considered as more collectivist than western cultures. Moreover, it has been robustly reported that people are more sensitive to information provided by ingroup members. Thus, we addressed whether people are more sensitive to information provided by their own

Friday (May 22), 10:30–11:30

ethnic group and whether eastern participants are more sensitive to information shared by several sources. We realized a cross-cultural study (France/Japan) where participants were confronted with social information after having performed a first order task. Social information consisted in faces that turned their attention toward the participant's response (congruent trials) or toward the opposite response (incongruent trials). At each trial, the participants were asked to rate their confidence in their response. We manipulate the number of social sources and the group membership. Preliminary results indicated that the participants' confidence raised for congruent as compared to incongruent trials. Moreover, this effect increased with the number of social sources. Ongoing analyses will reveal whether culture and group membership impact these effects.

Key words: metacognition, social influence, cross-cultural
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Metacognitive skill-development in Medical Education: A Pilot Study Considering Philosophical Tools of Thinking

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Philosophical reasoning is a slightly distinct way of thinking. It has specific features such as examination of thought systems by thought itself, and manipulation of thought processes. However, metacognition is a term that refers to awareness of one's thought processes and ability to control them. We hypothesized that the nexus between philosophical strategies of thinking (PST) and metacognitive skills (MS) is essential for decision making in critical situations, especially in medicine. In fact, both studying and practicing medicine have many difficulties such as retrieving of particular data from medical data stack in a particular case and inferring the adequate consequences.

The aim of our research is, basically, considering these strategies, whether improvement is possible or possible to what extent in MS. We designed pilot-curriculum to a group of second-term medical students (n=10). This scheme is composed with basic PST, for instance, hypothetico-deductive method, exposing causality with necessary and sufficient reasons. These strategies which interwoven into second-term medical education, taught in a selective course (2 hours per week). This study is an ongoing project that due date is May 7th, 2015. Students hitherto have been assigned two tasks. No significant relationship was found between gender and MAI scores ($p>0.05$).

Tracking social agents' mental states modulates action preparedness in adults

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Successful social interactions require understanding that representations about the world reflect a subjective point of view. However, the knowledge a person brings into the interaction may be inaccurate and sometimes even incorrect. Consequently, these expectations are sometimes driven by false beliefs. Recent studies suggest that 18-month-olds not only track a protagonist's belief, but show active helping (Buttelman et al., 2009) or attempts to correct the possibly erroneous actions (Knudsen & Liszkowski, 2012) if they expect that others' behavior will be driven by false beliefs. In the present study we investigated whether processing others' mental states will elicit spontaneous preparedness for action also in adults. Participants (N=25) watched movies involving a central character that placed a ball in a pipe-system with opaque segments. In the false belief condition the ball moves to a new location while the character is turned away. In the true belief condition the character sees this transfer. Participants were asked to continuously press a button till a specific cue was presented, and then point to the actual location of the ball on a touchscreen. Our data show that participants released the button faster in the false than in the true belief condition, suggesting that tracking other agents' false beliefs results in a greater preparedness for action in adults.

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Self-reported preferred thinking style and cognitive reflection

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The aim of the study was examination of relationship between self-reported preferred thinking style and cognitive reflection.

Total sample of 275 participants (225 women) completed the Cognitive reflection test (CRT, Frederick, 2005) - 7 items version measuring ability to override intuitive response and find a correct answer and the Type of intuition scale (TIntS, Pretz et al., 2014) measuring self-reported preference for four intuitive thinking style: holistic-abstract intuition, holistic-big picture intuition, inferential intuition and affective intuition. 98 of participants (78 women) completed also the Rational-experiential inventory (REI, Pacini & Epstein, 1999) measuring self-reported preference for rational and experiential information processing.

Friday (May 22), 10:30–11:30

Correct answers in CRT correlated positively, but weak, with rational thinking style ($r=.301, p=.003$) and inferential intuition ($r=.132, p=.029$); and intuitive answers in CRT positively correlated with experiential thinking style ($r=.262, p=.009$) and affective intuition ($r=.151, p=.012$). On the other hand, positive correlations were found between self-reported scales REI and TIntS (for REI-R – TIntS-I $r=.264, p=.009$; REI-E – TIntS-A $r=.602, p<.000$; REI-E – TIntS-HA $r=.397, p<.000$, REI-E – TIntS-I $r=.288, p=.004$). Weak and moderate correlations between self-reported preference for intuitive and rational thinking style, but only weak relationships of self-reported preferences with performance in CRT point out that people were consistent in self-assessment, but the performance did not meet self-image.

This work is part of research project Centre of Excellence SAS 'Centre for Strategic Analyses "(CESTA) III / 2 /, 2011.

Key words: intuition, cognitive reflection, thinking styles, rationality

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Congruency sequence effect in the ratio bias paradigm

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The ratio bias is a well-known task in the reasoning paradigm where people tend to experience conflict between the heuristic and analytic answers (Denes-Raj & Epstein, 1994) or between two possible choices (Bonner & Newell, 2010). The intervention of top-down processes are crucial in resolving this conflict. However, the recruitment of the cognitive control is still an open question. The conflict monitoring hypothesis (Botvinick, Braver, Barch, Carter & Cohen, 2001) suggests that the experience of conflict plays a crucial role in the activation of the top-down processes. In this research, we tested the conflict monitoring hypothesis in the ratio bias paradigm. After controlling for possible feature repetitions effects, our analysis revealed that the experience of the conflict results in a better subsequent conflict resolution. Limitations and future directions are discussed.

Key words: Reasoning, ratio bias, congruency sequence effect, conflict adaptation, cognitive control

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Friday (May 22), 10:30–11:30

Ostensive-Referential Communication Fosters the Interpretation of Pictures of Objects as Symbols of their own Kind in 9-Month-Old Infants

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We addressed the question whether ostensive-referential communication could make infants take familiar objects as exemplars of their own kind. We measured the P300 ERP component and desynchronisation of alpha-band EEG oscillations in a category oddball paradigm.

Experiment 1: 9-month-old infants were presented with exemplars of mugs and spoons in an oddball fashion. Participants responded to the infrequent stimuli with larger P300 component over posterior region, but no attenuation of alpha oscillation was found. This suggests the infants perceived the oddball objects, but did not identify them as belonging to a different kind.

Experiment 2: 9-month-old infants were exposed to the same events as in Experiment 1, but each trial was preceded by an ostensive utterance and a pointing hand. A larger P300, as well as stronger alpha attenuation were found in response to the oddball category suggesting that ostensive-referential communication fosters the interpretation of objects as exemplars of their own kind.

Infant-directed ostensive communication could designate an object as a symbol for its own kind, which may support the learning of generic object properties.

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The effects of script based schemes on retrieval of novel events

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Our study of semantic memory organization examined schemes' effect to retrieval. Based on Schank's dynamic memory theory we tried to activate participants' TOPs, and therefore influence the retrieval of their event memories.

By reediting different movie trailers we created novel events that were incoherent (with incomprehensible storyline). We also manipulated the mode of schema activation by either naming the trailer's genre (labeling) or presenting priming stimulus beforehand. In the control condition no schema was activated.

We hypothesized that viewers will selectively retrieve some part of the trailer according to their own expectations when they meet an incomprehensible storyline. However, if we actively manipulate scheme activation either with explicitly labeling in

Friday (May 22), 10:30–11:30

advance, or implicitly (priming) can influence retrieval. The more coherent the narrative, the more accurate is remembering.

We measured retrieval by rating the coherence of narratives given by the participants. Results show the priming group's stories were significantly less coherent than those of both the label and the control groups. Also the label group performed significantly better than the other two groups in recollection of the presented stimuli.

We assume that retrieval of novel events is fairly accurate by itself but can be spoiled by using an inadequate scheme.

Key words: semantic memory, script theory, coherence, retrieval

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The effects of valence and images on the source monitoring

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The pictures recognition depends on the recovery of perceptual and semantic clues via a recollection processes. The words recognition will instead be based on a familiarity process, the phonemic and the lexical clues. However, with an imaging instruction, the representation of the word then contains a quasi sensory-perceptual attribute which increases likelihood that recognition will be based on the recollection. But, in this case, it should be more difficult to decide whether the studied item was a word or a picture. Nevertheless, the emotional valence of the items could reinforce the distinction between words and pictures. A corpus of words and photos (positive valence, negative and neutral) was established for the study. One week after seeing photos with words or words alone, participants have to clarify whether the word has been seen with a photo or has been imagined. Results show that words are better recognized when they are presented with photos. In contrast, the false

recognition rates are higher when words have been imagined. Lastly, the recollection based on details is more frequent when items are positive and when they have been perceived. Take into account the emotional valence of the information and its format are important factors which allow us to move forward on processes involved in false memories creation, for example in the eyewitness testimony.

Key words: emotion, imagination, false memory, source monitoring

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Friday (May 22), 10:30–11:30

How likely is it that Snakes are not Reptiles? A ‘new paradigm’ approach to Belief Bias.

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The new paradigm in reasoning research emphasises a shift away from dichotomous true/false statements and instead embraces the probabilistic nature of the real world. In belief-bias studies, belief and logic are manipulated to induce heuristic-analytic biases, and participants are asked if conclusions necessarily follow from premises. The present study replicated previous belief bias experiments but instead asked ‘how likely’ conclusions were to follow, hypothesising that response patterns and response times would replicate the dichotomous response studies. In an online experiment 44 participants (13 male participants and 31 female) responded on a sliding scale whereby 10 = necessarily true, 5 = possibly true and 0 = impossible. Standard effects of belief-bias were replicated, with main effects of Validity ($p < .001$) and Belief ($p < .001$) and an interaction between the two ($p = .036$). Moreover, response time effects replicated previously demonstrated patterns, with main effects of validity ($p < .001$) demonstrating increased response times for invalid conclusions and with significant interaction ($p < .001$) whereby invalid-believable problems exhibited the longest response times. These data indicate that current theories of belief bias are robust to a shift toward a probabilistic variation of the belief bias paradigm and may be adapted to incorporate probabilistic variations of the task.

Key words: Belief-bias, Dual Process theory, Reasoning

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Enhancing neural excitability of the right vs. left prefrontal cortex differentially affects consolidation of implicit statistical learning

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Picking up statistical regularities of patterns from the environment is essential for predictive and adaptive behavior, decision making and reasoning. One of the most important challenges is to understand how statistical learning occurs and how the acquired information consolidates and stabilizes in the brain. Evidence suggests that the prefrontal cortex (PFC) has a critical role in these processes; the division of labor between hemispheres, however, is less characterized. The aim of the present study

Friday (May 22), 10:30–11:30

was to directly investigate the causal role of the right and left PFC in implicit/incidental statistical learning and its consolidation. Transcranial direct current stimulation (tDCS) over the right or left dorsolateral PFC (DLPFC) was applied during implicit statistical learning in order to modify learning-related cortical plasticity in the targeted brain regions by increasing neural excitability. Performance was tested during stimulation and 12-hour later. In order to investigate how brain stimulation during learning affects sleep-dependent memory consolidation, we compared experimental groups who did or did not have sleep in the 12-hour consolidation period (AM-PM vs. PM-AM design). Here we show no sleep effect on consolidation of implicit sequence memories in sham condition, however, the interaction between sleep/no sleep condition and tDCS on right vs. left DLPFC was significant. Our results can lead to a deeper understanding of the relationship between sleep and memory consolidation.

Key words: implicit learning, transcranial direct current stimulation (tDCS), sleep, statistical learning and consolidation, prefrontal cortex

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Moral reasoning among adolescents and elderly- a group study

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OBJECTIVES: Kohlberg defined moral reasoning as a thinking process with the objective of determining whether an idea is right or wrong. His theory specifies six stages of moral development, arranged in three levels where individuals can only progress through stages one stage at a time and can neither skip stages nor return to any previous stage. The objective of this study was to examine the development of moral reasoning in two age groups.

METHOD: A group study was designed by interviewing subjects about particular hypothetical dilemmas asking for solutions and a justification for that solution in two age groups of similar socio-economical status: adolescents (15 girls, 14 boys, mean age: 17,45 yrs, SD: 0,68) and elderly (15 men, 17 women, mean age: 72 yrs, SD: 4,83).

RESULTS: Significant difference was found between groups with respect to the principled morality index and also the co-existence of more than two moral stages could be observed within each group.

CONCLUSIONS: Our findings support the theory of the Neo-kohlbergian complex model of moral development where a subject is not assigned one for one to a stage over development but stages overlap and mix in a complicated way.

Key words: Kohlberg, moral reasoning, Neo-kohlbergian model, principled morality

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In which box does this number go? Breaking down the number categorization task.

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During early school years, children develop an ability to represent the constant distance separating consecutive integers. To assess this, the most commonly used task consists in asking children to indicate the location of a number on a physical line representing a given numerical interval. An alternative, more intuitive task consists in asking the participants to categorize numbers according to their size. Both paradigms have shown a shift in children's responding with age, going from a compressed (logarithmic-like) pattern, where more numbers are placed on the side of "large" numbers, to a linear pattern, where numbers are evenly placed on the line or across the categories. We tested a group of 362 participants between 1st and 3rd Grade on a number categorization task using three categories ("small", "medium", "large") to divide the 0-100 interval. While we replicate the developmental trajectory described above, detailed regression analyses showed ambiguous response patterns in many participants, some of them even producing apparent inverse-log scales. Our results question the validity of the numerical categorization task as a tool to assess children's scale of representation of numbers, as the specific strategies used by children in this paradigm may preclude access to their mental scale for number.

Key words: numerical cognition, categorization, development, number representation

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Session 2

An integrative metacognitive model of mindfulness

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Mindfulness is often defined as a mental state achieved by focusing one's awareness on the present moment and acknowledging one's feelings, thoughts and bodily sensations. Kabat-Zinn (1990) describes mindfulness as bringing attention to moment-to-moment experience.

Here we provide a theoretical framework and systems-based multi-level metacognitive model of mindfulness that focuses on integration of top-down and bottom-up forms of self-regulation. We postulate and discuss following hypothesis: (1) mindfulness is related to the highest level of metacognition; (2) mindfulness depends on dynamic cooperation of three main components of the metacognition (metacognitive knowledge, metacognitive experiences and metacognitive skills); (4) intentionally practiced mindfulness decreases dissociations between awareness and meta-awareness; (5) components of mindful meta-level develop and change during continuous practice. The model is discussed in the light of other theoretical approaches to mindfulness concept and empirical data provided by studies examining the relations between mindfulness, hot and cold executive functions and metacognitive abilities.

We believe that presented model provides some helpful guidelines for future basic and clinical research, specifically targeting areas of development in the treatment of stress-mediated psychological disorders.

Key words: metacognition, mindfulness, meta-awareness, compassion

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Interference and priming in spontaneous belief computation

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Humans encode other agents' mental states and these attributed mental contents affect participants' behavior. Kovács et al. (2010) found that the attributed belief about an object being behind the occluder primed the participants' response in a

visual detection paradigm resulting in faster detection of unexpected objects. Will the avatars' belief interfere with the subjects' resulting in slower object detection if there are different beliefs about what object is behind the occluder? In the current study, with the avatar being present one of the objects moved behind the occluder. Then this object is switched for the other; this switch is either witnessed by the avatar or not, depending on the condition (True/False belief). Then the occluder is raised, and one of three outcomes are presented for the participant: one of the two or both objects; participants reaction time being measured in detecting the outcome. For the one object outcomes we found that the participants (N=22) had faster RT for objects they expected (effect of own expectation ($p=.02$)). Crucially we also found that they were slower when the avatar had a different belief (effect of belief condition($p=.03$)). This result shows that attributed beliefs can interfere with participants' own beliefs.

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Machine Learning for the Estimation of UPDRS score

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Parkinson's disease is one of the most remarkable neurodegenerative disorders affecting motor and cognitive abilities of elder people. One of the key components of successful treatment is regular monitoring of the patient's status. Usually, UPDRS score is used for regular monitoring which is often time consuming and it is highly affected by examiner subjectivity. In order to continuously measure the patient's UPDRS score, telemonitoring was proposed. The basic idea is to estimate UPDRS score based on biomedical voice recordings that can be captured while the patient makes telephone calls or Skype calls using his/her smartphone or tablet.

In our work, we aim to estimate UPDRS score based on biomedical voice recordings using regression methods. We compare various regression techniques including linear regression, regression trees, neural networks and nearest neighbor regression. Our results show that the best regression technique is able to achieve mean absolute error of 3.08 on predicting the motor UPDRS scores in the publicly available Parkinsons Telemonitoring dataset from the UCI repository if the initial UPDRS score of the patient is taken into account. This evaluation protocol simulates the scenario when the UPDRS score is initially measured by a clinician and subsequently the UPDRS score is estimated in a telemonitoring setting.

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A Holistic Theory on the Development of Cognitive Biases in Real-Life Decisions

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Real-life decisions, contrary to decisions in the laboratory, mostly take place in complex situations. Thus, it's hard to find the exact reasons, which lead to sub-optimal decisions. Therefore, this paper analyses the interaction between the characteristics of complex situations (Schroda, 2000), the computational architecture of psychological processes (PSI theory, Dörner, 2013) and the occurrence of cognitive biases (Carter, Kaufmann, Michel, 2007).

The developed model delivers a) an approach to identify the situation's characteristics (complexity, dynamics, time pressure, uncertainty, etc.) which trigger motivational, emotional and cognitive influences on the decision-making process and b) an explanation which combination of these influences lead to which kind of cognitive bias.

In a first step, decision experts rated the influence between the components of the PSI theory and the different cognitive biases with a cross-impact-matrix (Vester, 1994). The second step aims at verifying the findings in the field by analyzing erroneous decisions of entrepreneurs. According to Shepherd, Williams and Patzelt (2015), they are more biased in decision-making than non-entrepreneurs.

The holistic approach provides a deeper insight into the network of cause and effect of the development of cognitive biases. It therefore serves as a good starting point for a focused debiasing intervention.

Key words: Cognitive Bias, Decision-Making, Complexity, PSI theory, Cognitive Architecture

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Psycholinguistic analysis of conjunction in Croatian

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Agreement patterns vary significantly across languages and constitute a challenge for linguistic theories. The obligatory nature of agreement in Slavic languages makes them felicitous for studying the factors that contribute to the computation of agreement patterns. In this study the preferences for agreement are studied with eye-tracking (regressions and fixations within AOI) in sentences in which the Subject

Friday (May 22), 14:30–15:30

NP is a conjunction of words of different gender and the Predicate is a Participle. Croatian speakers prefer default to linear agreement, i.e. in sentences in which the Subject is a conjunction of feminine and neuter nouns the preference for the Predicate will be the Participle in masculine. Theoretical accounts of this findings will be given in terms of Boolean IP constituents.

Key words: agreement, conjunction, gender, number, Croatian

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Evidence for spontaneous level-2 perspective taking in adults

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Spontaneous, online perspective taking seems to be limited to tracking which objects others have visual access to (level-1). Representing how those objects appear to them (level-2) has not been found in indirect tests previously. We hypothesized that spontaneous level-2 perspective taking would occur given that the two participants had the same task on jointly attended stimuli. This creates a mutual "problem field", ensuring that participants had the same object feature in their focus of attention. Pairs of participants sat opposite each other and saw symmetric (0,8) and asymmetric (6,9) stimuli on a screen, laid between them. Participants either had the same task (number verification) or different tasks (number verification and n-back based on the color of the characters). They had both individual and joint trials. In the same task group, jointness worsened RT-s for the asymmetric numbers more than it affected RT-s for symmetric numbers. In the different tasks group no such interaction was found. Our findings reveal that the phenomenon of on-line level-2 perspective taking exists. Results indicate that sharing a problem field triggers involuntary perspective taking, but being simultaneously engaged with the stimuli by performing different tasks is not sufficient to do so.

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Conscious monitoring of emotion perception: evidence from attentional blink

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According to a higher-order approach, metacognition is the underlying mechanism of conscious awareness. One of the important functions of metacognition is to monitor the state of first-order representations via a bottom-up fashion. In the present study, we investigated bottom-up monitoring of emotional responses by examining a hypothesis of the relationship between emotion discrimination and metacognitive content regarding the correctness of decisions under the attentional blink paradigm. Participants were presented with happy or fearful expressions within the stream of rapidly changing distractors (RSVP), and rated their metacognitive contents with confidence ratings regarding accuracy of perceptual discrimination. Similarly to other attentional blink studies on emotion perception our results showed above-chance perceptual discriminations for both emotional expressions, although stronger responses were shown for fearful items. We also observed that participants were aware of the correctness of first-order decisions, however metacognitive contents in higher extent reflected perceiving fearful targets. Our results have implications for higher-order theories of consciousness suggesting that information of greater biological relevance generate more vivid first-order representations resulting in stronger higher-order representations through bottom-up conscious monitoring. ACKNOWLEDGMENTS. This research has been supported by the National Science Center (Poland), and funded under the grant's decision DEC-2011/03/B/HS6/01799 to R.S.

Key words: Metacognition, Attentional Blink, Emotions, Facial Expressions
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Impact of semantic encoding effects on arithmetic problems in sorting and solving tasks.

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In the process of understanding a mathematical problem, representations are induced by the solver at an intermediate level of abstraction that neither coincides with a situation model nor with the abstract mathematical structure. In two

experiments, we manipulated the nature of the quantities (e.g., time units, distance units, monetary units, etc.) that could mediate these representations.

We created simple arithmetic problems that could all be solved by two strategies (either a one-step strategy or a three-step strategy). We hypothesized that only one strategy would be available at a time, depending on the semantic representation induced.

In the first experiment, we asked 120 adults to sort problems depending on the strategies they would use to solve them. A multidimensional scaling analysis performed on the resulting categories showed that the main factor accounting for the spontaneous classifications was consistent with the variations introduced between the quantities.

In the second experiment, 60 participants were instructed to solve similar problems using a minimal number of steps. The results showed that the choice of one of the two possible solving strategies depended on the representations induced by the problems, even when the subjects were instructed to use the shortest strategy they could think of.

Key words: reasoning, problem solving, semantic structure, strategy choice

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Coordinated Reasoning

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When trying to explain how humans reason, it is common to look for applications of inference patterns, such as deductive laws of logic. Deductive reasoning tasks focus on testing the way lay people use some logical skills, taking for granted that the 'logic' used is classical logic. However, if one agrees that one must reason 'to' an interpretation before reasoning 'from' an interpretation, coordination on the meaning of instructions between experimenters and subjects is a precondition to drawing conclusions about reasoning. Moreover, the linguistic form of the instructions yield certain pragmatic constraints on the semantic content of the instructions, so that the relevant information is not automatically identified by subjects. Through the example of the Double Disjunction Task used in the Theory of Mental Models, I propose a new model for reasoning tasks, based on coordination between experimenters and subjects, not only on the syntactic form of the reasoning, or the semantic content of the instructions, but also on the pragmatic influences that constrain those instructions. This model can be represented as a double signaling game between the subject and the experimenter, where a solution exists when coordination is reached at several levels in each game and across games.

Key words: Psychology of reasoning, logical inference, pragmatics

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Is belief re-computation by retrieval available for young children?

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A newly emerging question in Theory of Mind (TOM) research is when exactly the attributed belief is computed. Taking as example the standard location change task (SLCT), one can assume that belief is computed when (i) Sally puts her chocolate into box A, or (ii) when Sally comes back and is going to choose from the containers in order to find her chocolate. The second possibility (ii) also includes explicit belief updating situations that could occur when the task itself or other situational requirements induce a memory search process to find information related to the belief (as a potential cause to predict behavior) of a social partner. We tested 3-year-old children with a modified SLCT in which children were presented a ‘true belief situation’, in which the model was present during the location change and was wearing sunglasses. However, then children were allowed to explore her sunglasses, and it turned out that the sunglasses were opaque. Thus based on their novel knowledge on the situation children could infer that the model could not follow the situation despite her presence. If children can re-compute the belief content of the model, they should act as in a false belief situation. Preliminary results suggest that 3-year-olds can re-calculate the attributed belief based on their memories of earlier events.

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The domain-generalty of working memory: A matter of ability

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Working memory refers to the set of processes that enable one to hold goal-relevant information in mind in the face of concurrent processing and/or distraction.

Individual differences in working memory are studied with complex span tasks, which belong to different domains. Latent variable analysis reveals a general factor of working memory, which is generally referred to as “working memory capacity” or WMC. Thus, whereas working memory as an intra-individual construct is domain-specific, WMC appears to be largely domain-general. Yet this conclusion is controversial: there are latent variable studies that favor domain-specific models.

Friday (May 22), 14:30–15:30

We explored differentiation in WMC in two studies, applying a novel statistical method, moderated factor analysis. Differentiation refers to the phenomenon that the magnitude of correlations between tasks that tap different domains are inversely related to ability. The first study (N= 5316) demonstrated the existence of differentiation in three complex span tasks: as capacity itself increases in a population, WMC becomes domain-specific. The second study (N=249) demonstrated that differentiation also occurs in WMC as the function of ability level in fluid reasoning (Gf).

These results put the entire domain-generalty of WMC debate in a new perspective, and highlight the importance of the capacity level of the samples studied.

Key words: working memory capacity, differentiation, moderated factor analysis, individual differences

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"But I was there!" - episodic memory as a mechanism for justification

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It is arguably a defining feature of episodic remembering that it provides one with evidence that one had first-hand experience of a particular past event. So far there is no agreed upon account of what the function of a memory system with such in-built meta-representational features might be. We contend that a crucial function of episodic memory is to make available reasons to justify one's claims about the past through the use of source information. On this view, episodic memory is part of a larger array of systems serving productive communication by ensuring that assertions are justifiable. As such, episodic memory would ensure the veridicality of beliefs about the past only in so far as it would be important in communicative situations. Here, we present an experimental paradigm designed to test this hypothesis.

Key words: episodic memory, source memory, meta-representation, justification

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Friday (May 22), 14:30–15:30

Oxytocin modulates social categorization processes

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Research from the past years has pointed out the importance of the neuropeptide oxytocin in regulating various aspects of social interactions, such as inter-group behavior. This study explores the question whether such effects may also be present in social categorization processes. 24 adult males participated in the study with an age range of 18-35 years. In the first part of the experiment, half of the participants received intranasal oxytocin, while the other half was given placebo. After a 40-minute-long waiting period, participants' categorization processes were assessed with the memory confusion paradigm. Participants watched a presentation that showed pictures of six adult men - three belonging to the Caucasian and three to the African-American racial group. Each face was presented seven times and the photographs were always accompanied with an utterance. In the test phase, participants had to match the sentences to the faces from memory and the pattern of errors was analyzed. The classical results obtained with this paradigm show that people commit more within-group than between-group errors, which shows that people organize information based on social category membership. Our preliminary results indicate that this effect can be mitigated by the oxytocin administration.

Key words: oxytocin, social categorization, race, memory confusion paradigm

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Pragmatic aspects of reasoning in real life situations

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It is a well established fact that people, when reasoning, do not follow the laws of logic but provide information that they consider relevant for the discourse situation. In fact, the inferences that are found in spoken language are often logically invalid. In this study we analyze the Croatian corpus of spontaneous spoken language to find patterns of reasoning and analyze them. In order to convey the intended meaning participants in the conversation rely on the discourse markers. We concentrate on 'if - then', 'therefore', 'moreover' and 'although' discourse markers as the facilitators of logical or causal inferences.

The analysis will include two aspects of reasoning: logical form of the inferences found in spoken language and the quantity and the precision of the information that is exchanged in the discourse situation (e. g. how precise speakers are in telling time regarding the discourse situation).

The corpus consists of 51 transcripts of spontaneous conversations between Croatian adult speakers (20+) and is analyzed with CHAT/CLAN programme package.

The study is conducted within the project "Adult language processing" (UIP-11-2013) founded by Croatian Science Foundation.

Key words: reasoning, relevance theory, discourse, spoken language corpora

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Behavioral task as tool for short-term verbal memory and cognitive vulnerability to depression assessment in mesial temporal lobe epilepsy

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Main generators of epileptic seizures in mesial temporal lobe epilepsy (MTLE) are the amygdala and hippocampus, which are also associated with memory and depression. We applied the free recall memory task in order to evaluate short-term verbal memory and to explore possible cognitive vulnerability to depression in MTLE. We also investigated the correlations between self-reported inventory scores and memory results in MTLE subjects. Inventory scores included the Quality of life in epilepsy inventory total score and its cognitive functioning domain score and BDI II. We hypothesised that short-term memory in MTLE is impaired and cognitive vulnerability to depression may be present. MTLE subjects (N=39) were paired with healthy controls according to age, sex and education.

Compared to controls, MTLE subjects have significant memory deficit, measured by number of correctly recalled words. Only in control subjects, memory for negative valence words is significantly reduced in comparison with neutral or positive. Within the MTLE group, memory is significantly reduced in its total score and for positive valence words if depressive symptoms are present. The memory results significantly correlate with each self-reported questionnaire score.

Key words: temporal lobe epilepsy, behavioural task, short-term verbal memory, cognitive vulnerability to depression, self-reported subjective inventory

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Friday (May 22), 14:30–15:30

Metamemory in educational psychology

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The objective of this poster is to indicate important gaps in empirical research in the field of educational psychology on the subject of metamemory. First of all the concept of metamemory is rarely discerned from metacognition. Moreover metamemory is traditionally believed to consist of two aspects: one is related to self-consciousness and the other is the knowledge about the memory in general. One may be surprised to find so little research has been done on the latter aspect, with regard to interpersonal relations. This shortage is clearly problematic as far as understanding of the process of teaching is concerned. Last but not least as the scarce research concerning the interpersonal aspect of metamemory focuses solely on the metacognitive capabilities of students, it neglects the question of the teachers' capabilities. Filling this absence could lead to a better understanding of how metamemory functions between people, and - ultimately - would help to improve the teachers' training.

Key words: metamemory, educational psychology, review

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The role of executive functions in patients with aphasia

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Recent studies suggest that together with language abilities executive functions (EFs) can also be impaired in aphasia. Moreover, these functions can play a role in language processing. We examined the updating of working memory (WM), and two inhibition functions: prepotent response inhibition (PRI) and representational conflict resolution in eight patients with aphasia with a lesion in their left frontal lobe, and eight controls. Then we analyzed the relationship between EFs and language performance.

We expected patients with aphasia to demonstrate lower performance on tasks involving EFs than controls, and we also hypothesized that language comprehension is going to be associated with updating and/or inhibition abilities in aphasia.

Our results showed that PRI and updating WM representations are both impaired in aphasia. Performance on comprehension of grammatical structures and updating WM representations correlated at a trend level, but we did not find relationship between language comprehension and any of the inhibitory functions.

Taken together, generally observed linguistic symptoms of aphasia seem to be accompanied by impairments of EFs (PRI and updating processes). The deficit in updating might affect language comprehension in aphasia.

Key words: executive functions, aphasia, inhibition, updating

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A comparison of possession comprehension in children with typical language development and children with specific language impairments using E-prime

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In Croatian, possession can be expressed in many ways, but the usage of possessive adjective is preferred for animate possessor, and for inanimate possessor preferred is the usage of preposition "od" followed by genitive "od+gen". The aim of this paper was to compare and identify if there were differences in comprehension and differentiation of correct language forms for expressing possession of animate and inanimate possessor, and also in the speed of correct form detection. Two groups of participants were included: 10 children with typical language development (TLD) and 10 children with specific language impairments (SLI), aged 9-11, included in speech and language therapy in Polyclinic SUVAG. The experiment was run using the E-prime experimental software. Participants had to press a button if the language form presented visually was correct. The results were surprising because SLI children were more successful in detecting the correct form for expressing possession of animate possessor than TLD children, while TLD children were more successful in detecting correct form for expressing possession of inanimate possessor. Results also showed that SLI children had longer reaction time.

Key words: possession, specific language impairments, e-prime

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Deductive problem solving and learning logic

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Is there any correlation between fluid intelligence (Gf) and fluencies in both 'easy' and 'difficult' deductions? Does learning logic have any impact on the level of fluencies in both kinds of deductions?

Tools: Raven's APM (alpha = .83), Deductive Reasoning Test (DR, alpha = .64), Erotetic Reasoning Test (ER, alpha = .78), Polisylogisms Test (PS; McDonalds omega total = .8); DR, ER and PS were designed by the authors, operationalizing 'easy' (DR) and 'difficult' (ER and PS) deductions.

Subjects: Our subjects (154 students, M=21,69, SD=1,44) formed groups of lower (group C) and higher (groups A and B) abilities with respect to fluid intelligence and of extensive (group A) and very limited (groups B and C) training in formal logic.

Results: Groups A and B performed better than group C in APM, DR and ER. Group A obtained significantly higher results than group B in ER and PS; their performance in APM and DR were comparable. We conclude on this basis that deductions of different complexities call for different abilities to be manifested and that fluency in difficult deductions, while related to Gf, depends also on subjects' experience and that this does not hold in case of simple deductions.

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The role of inferential direction on psychotherapist's metacognitive confidence and need for more information

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The non-decomposable nature of a psychotherapy sessions favors the use of intuition (Hammond et al., 1987). The feeling of rightness associated to intuitive judgments (e.g., Koriat, 2012, Thompson et al., 2012) may lead to therapist's overconfidence and to a decreased need for seeking further information. This may

compromise therapists' willingness to critically evaluate their initial clinical (intuitive) judgments.

We hypothesize that this tendency could be moderated if besides causal explanations (backward inferences) therapists were requested to make predictions (forward inferences) based on the same session information. Predictions are inherently associated to more uncertainty than causal explanations (Hogarth, 2010) therefore they could decrease overconfidence in the clinical judgment and promote further information seeking.

To test for this, psychology students were asked to find causal explanations and make predictions about a hypothetical client. Preliminary results showed, as expected, higher uncertainty associated with predictions. Moreover, participants tended to use their backward inferences instead of their predictions to prepare their future clinical work. Strategies to avoid the overconfidence stemming from first intuitions are discussed.

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Individual differences in state-dependent decision making depend on cognition, and metacognitive monitoring and control

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We carry out or withhold from actions whose utility depends on our judgements being accurate. Cognitive models suggest that such decisions are carried out when metacognitive confidence in the presumed state exceeds a decision control criteria. Little work has been done, however, to determine whether robust individual differences in decision behaviour can be explained by individual differences in metacognitive monitoring and control. Undergraduate students (N=364) completed nine tests assessing fluid and crystallized cognitive abilities, indicated confidence levels in their answers, and made state-dependent decisions on each answer (e.g., submit for marking or not). The nature and quality of individuals' decisions were described with novel Decision Pattern Analysis metrics: competence, optimality, recklessness, hesitancy and decisiveness. In line with cognitive theories, the relative standing of individuals' decision optimality was predicted and manipulated by changes in the cognitive requirements of the task, while individuals' standings on the other decision metrics were predicted and manipulated by changes to the nature of the decision, which influenced individuals' metacognitive variables. Personality variables made no contribution to the results. The results demonstrate how individual differences in state-dependent decision making can be explained by differences in cognition, monitoring and control.

Friday (May 22), 14:30–15:30

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Session 3

Solvable or Not Solvable? Heuristic Cues that Underlie the Judgment of Solvability

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Meta-reasoning is an emerging domain within the Metacognitive research, which deals with reasoning and problem solving. Judgment of Solvability (JOS) reflects the assessed probability that a problem is solvable. Initial JOS takes place upon approaching a problem and final JOS is done after a solving failure, and may be a basis for deciding whether to try again. To date, the bases for these judgments are unknown. Response latency and accessibility (amount of associations that come to mind regarding a question) are well-established heuristic cues for meta-memory judgments. Our hypothesis was that these cues are predictive also of both JOS types, but not necessarily in the same manner as in meta-memory. Solvable and unsolvable compound remote associates (CRA) were used. In Experiment 1 we examined response latency and accessibility as cues for JOS. As predicted, quick response latency predicted high initial JOS, as in meta-memory. However, the reverse pattern was found for final JOS. High accessibility predicted high JOSs, but this was a misleading cue, as in fact success rates dropped with accessibility. In Experiment 2 we examined the same cues when judging memorizing of the same stimuli. The comparison revealed shared and distinct mechanisms of meta-reasoning and meta-memory.

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Assessment of Non-Native Speakers' Metacognitive Abilities and Reasoning Stem from Rational Thinking to Adopt a New Template of Language Grammatical Aspects: Evidence from MEG and fMRI

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Purpose: Using MEG and fMRI, the aim of this study was to investigate non-native speakers' metacognitive abilities and reasoning stem from rational thinking to adopt a new template of Arabic grammatical aspects.

Design and Method: In this quantitative and qualitative study, two measurement tools were used to evaluate participants' performance: Two tests of grammatical production and neuroimaging test.

Saturday (May 23), 10:30–11:30

Settings: Al Khars hospital, KSA.

Participants: Twenty-three to thirty-year-old participants from 11 different nationalities (N = 14 all males).

Procedures: A within-groups design and a between-groups design are used to elicit participants' performance before comparing it in light of MEG and fMRI outcomes.

Interventions: Data were neurolinguistically analyzed before it was statistically visualized.

Main outcomes and Results: Non-native speakers' un-exposing to foreign/second languages in their critical period age disable them to adopt a new grammatical system easily. MEG can identify language lateralization and diagnose silent reading, while fMRI helps distinguish declarative knowledge from procedural knowledge.

Conclusions & Implications: Non-native speakers' grammatical mistakes could be avoided if we understand decoding processes in both audioceptive and ophthalmoceptive centers in the brain. Through signals, MEG and fMRI found to be effective means through which sensory cortex activation and language lateralization and localization can be differentiated.

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Overcoming intuitive interference in geometry: from brain studies to an educational intervention

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Students' difficulties in mathematics and science may stem from interference of the task's salient irrelevant variables. Here, we focus on a comparison of perimeters task, in which the area is the irrelevant salient variable. In congruent trials (no interference), accuracy is higher and reaction time is shorter than in incongruent trials (area variable interference).

A brain-imaging study indicated that correctly answering the incongruent condition is associated with activation in prefrontal brain regions known for their executive inhibitory control. These findings suggested that intervention aimed at activating inhibitory control mechanisms could improve students' success.

We explored the effect of an intervention that explicitly warns about the possible interference of the variable area. Eighty-four sixth graders performed the same test, with warning intervention (warning group) or without it (control group).

Accuracy in the warning group was significantly higher in incongruent conditions and reaction time was significantly longer in all conditions than in the control group. The results suggest that the explicit warning activates inhibitory control mechanisms and thus helps students overcome the interference.

Saturday (May 23), 10:30–11:30

Our findings point to the possibility of improving students' problem-solving abilities through simple and focused interventions that explicitly warn them about the trap in the task.

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Contaminated mindware and reflective mind

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Our study was inspired by Stanovich's (2011) proposed framework of assessing rational thinking. We used most of the tasks hypothesized to tap into resistance to miserly processing (e.g. resistance to belief bias, outcome bias, denominator neglect, cognitive reflection, disjunctive reasoning, and diagnostic hypothesis testing) and tried to verify whether some irrational beliefs (the contaminated mindware - CM) or thinking dispositions can serve as inhibitors of rational thinking.

596 students (mean age=19.8 years) completed battery of measures consisting of intelligence test, thinking dispositions measures, irrational beliefs, and rational thinking tasks. Only thinking dispositions proved to be predictors of whether a person will hold irrational beliefs, but both preferences for analytical as well as intuitive thinking styles predicted a higher degree of irrational beliefs. To test the hypothesis that CM inhibits rational thinking, we performed moderation analysis, where cognitive ability was a predictor, CM was the moderator, and the score in cognitive reflection test was an output. Model parameters were: $R^2=.077$; $p=.00004$; $n=287$; R^2 increase due to interaction $R^2=.00007$; $p=.883$. We found no support for the claim that CM inhibits cognitive reflection and we discuss the results in the paper.

This work is part of research project Centre of Excellence SAS 'Centre for Strategic Analyses "(CESTA) III / 2 /, 2011.

Key words: cognitive reflection, irrational beliefs, thinking dispositons, intelligence

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Saturday (May 23), 10:30–11:30

The impact of social context on children's executive functioning and its relationship to creativity

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Executive Functioning (EF) refers to a problem-solving process that develops during childhood, with a shift from mainly reactive control to flexible engagement of reactive and proactive control with age. EF, similar to other cognitive functions, develops within social context. Children profit from being with an adult, an older child, or a peer in a variety of social contexts. Cooperation has been hypothesized to enhance goal maintenance which can lead to proactive behaviour, and competition has not yet been tested among pre-schoolers. In the current study, we examined whether a social context such as cooperation or competition would enhance pre-school children's cognitive control strategy from reactive to proactive control, using an AX-CPT continuous performance task. Furthermore, we implicated a 3D Alternate Uses Task to test divergent thinking, as a component of creativity. Our results indicated significant effects of condition. Both cooperation and competition enhanced children's executive performance, although they continued to use a reactive control strategy. We also found that children who performed more accurately in the executive functioning task showed a poorer performance in divergent thinking, suggesting that the lack of appropriate cognitive control strategy may be actually beneficial at this age in certain circumstances.

Key words: executive functions, social context, cooperation, creativity

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14-month old infants represent others' beliefs about the number and identity of objects

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Infants' understanding of others' beliefs has been investigated through a wide range of tasks. We tested the proposed limitations of infants' mindreading capacities that should not extend to beliefs regarding object identity or numerosity (Butterfill & Apperly, 2013). We used a manual search paradigm where infants search longer if they think there is still an object present (Feigenson & Carey, 2003). Infants saw a scene where 1 (in Study 1, 3 and 4) or 2 (in Study 2) objects were put into a box by Experimenter 1 (E1). Then a further object was added (Study 1), one was taken out (Study 2), exchanged to another object (Study 3), or transformed into another

Saturday (May 23), 10:30–11:30

appearance (Study 4) by Experimenter 2 (E2). During this E1 could be present (True Belief condition) or absent (False Belief condition). Finally, E1 took out one object from the box. We measured how long infants searched for an object. Results show that search times were influenced by the belief of E1 regarding the number of objects [0/1] remaining in the box. This suggests that infants successfully tracked the other person's belief when it involved multiple objects; while taking into account the identity of objects involved.

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Metacognition and performance rating in spatial manipulation tasks

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Aim: The aim of the study is to reveal how metacognition promotes performance in basic spatial cognition tasks.

Method: The study examines the estimated performance of subjects grouped by profession (designers and non-designers) in four spatial manipulation tasks of increasing complexity (Kasek & Albu, 2014). The baseline task (Task1) is a modified Corsi where homogenous stimuli (dots) are displayed sequentially and requires correct localization. Task2 requires spatial recall of simultaneously displayed numbers in numeric order. Task3 repeats Task2 in self-paced timing (measured by inspection time; index A of metacognition). Task4 requires numeric interference-inhibition and correct localization. After each task, subjects are asked to rate their performance in comparison with their virtual peers (index B of metacognition).

Results: Results show positive metacognition effect on localization in Task3 by index A. Subjects' estimations of their own and their virtual peers performance - measured by index B - were precise. However, based on the results, designers tend to somehow underestimate their own performance.

Conclusions: Metacognition plays an important role in basic spatial cognition, includes monitoring and estimation of both self and others performance. On the other hand, it seems that type of expertness (e.g. designers) can moderately affect metacognition effectiveness.

Key words: metacognition, performance rating, spatial cognition, expertness

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Saturday (May 23), 10:30–11:30

Negative numbers in elementary school

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In our research we assume that the understanding of the numbers derives from the system in which they are anchored. Our hypothesis is that children discover the meanings of number words based on their knowledge about the objects, number words being anchored in the understanding of the objects semantic system, and matching sets. Children are able to perform those numerical operations that can be performed on the objects as well. Furthermore we assume that numbers could be anchored to other semantic systems too. Using a different kind of anchoring we can expand the set of meaningful operations, because they can be transferred from the newly anchored semantic system to the numbers.

We test this model with the learning of negative numbers. We expect that in the case of the original object based analogy the negative numbers are hard to understand. However, anchoring the numbers to a spatial number line can help understanding the operations on negative numbers.

Participants included first and second graders (8 and 9 years olds). In order to test the two possible anchorings, we gave the children simple arithmetical operations such as addition and subtraction, using different counting tools: either number line or marbles. According to the results children make less error with number line than with marbles. This result is in a dissociation with our former result showing that younger children prefer objects over a number line for operations with natural numbers. We conclude that anchoring the abstract layer of numbers to several domains can extend the capabilities of numerical understanding. This multiple anchoring is a key component in abstract mathematical thinking and flexible numerical processing.

Key words: negative numbers, semantic system, anchoring

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Low cognitive load and reduced arousal impede practice effects on executive functioning, metacognitive confidence and decision making

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We investigated the effects of low cognitive workload and the absence of arousal induced via external physical stimulation (motion) on practice-related improvements in executive (inhibitory) control, short-term memory, metacognitive monitoring and

decision making. Office workers (N=70) performed low and moderately engaging tasks in two successive 20-minute simulated drives and repeated a battery of decision making and inhibitory control tests three times – before, between and after drives. For half the participants, visual simulation was synchronised with (moderately arousing) motion. Others performed the same drive without motion. Performance significantly improved over the three test blocks, indicative of practice effects. Improvement was highest when both motion and moderate cognitive load were present. The same effects declined in the absence of motion or following a low cognitive workload task, suggesting two distinct pathways through which practice-related improvements in cognitive performance may be hampered. Practice, however, degraded certain aspects of metacognitive performance, as participants became less likely to detect incorrect decisions in the decision-making test with each subsequent test block. Implications include consideration of low cognitive load and arousal as factors responsible for performance decline and targets for the development of interventions/strategies in low load/arousal conditions such as autonomous vehicle operations and highway driving.

The authors were funded by the Defence Capability Development Group Project Land 121 Phase 4 (<http://www.army.gov.au/Our-future/Projects/Project-LAND-121>) under the Research Agreement 558023.

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The Source of the Distance Effect in an Artificial Number Sequence

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Distance effect in numerical cognition means that the closer two quantities are numerically, the more difficult it is to differentiate between them. However, instead of originating from the numerical meaning (i.e., values) of the numbers as in $5-2=3$, the distance effect might reflect a surface characteristic such as the connection of the labels.

While the meaning and the label connections correlate in normal circumstances (e.g., in the Indo-Arabic notation), artificial number sequences with gaps (e.g., 1, 2, 5, 6) can dissociate the two properties. In a sequence with gaps the meaning model predicts that the distance effect changes with the values of the digits (e.g., the 2-5 distance is 3), while the label model predicts that the distance effect changes with the position of the digit in the incomplete series (e.g., the 2-5 distance is 1).

Participants learned artificial symbols for the 1, 2, 3, 7, 8, and 9 numbers and then compared them in pairs in which they had to choose the numerically larger number.

Saturday (May 23), 10:30–11:30

Both models were able to explain our data to some extent, thus suggesting that both label and meaning jointly contribute to the distance effect.

Key words: numerical cognition, distance effect

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The Trusting Twos: The epistemic weight attributed to communication increases during toddlerhood.

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We report data suggesting that the epistemic weight given to communicated information varies during development. Infants appear to be surprisingly reliant on communication, even when it conflicts with previous perception. Moreover, contrary to the view that children become more skeptical with age, we find that trust in communication increases during toddlerhood.

In Study 1, 15-month-olds have to find a toy hidden under one of two buckets. They first see where the toy is hidden, and later an informant tells them that the toy is in the other bucket. Contrary to what adults would do, children trust communicated information rather than their past perception, even when they have evidence that the communicator's belief about the toy's location is false. Controls indicate that children do not go along with what the informant tells them just to please her, and rather genuinely believe her.

Study 2 shows that human's trust in communication increases during the second year of life. In a setting identical to Study 1, twenty-four-month-olds trust communication even more than 15-month-olds.

Increased communicative abilities and opportunities to learn from others could justify the 'Trusting Twos', a developmental stage of heightened trust in communicated information.

Key words: trust, information integration, naive epistemology, communication

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Is writing metarepresentational?

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The standard view of writing, dating back to Aristotle, sees writing as a derivative code: a secondary representation of a natural language. This view has been challenged. It has been noted that writing cannot be said to represent speech, but

Saturday (May 23), 10:30–11:30

rather, more abstract properties of natural language. The status of visual codes such as pictographies, mathematical or musical notations, etc. can also be discussed in this connexion. This poster will defend a revamped version of the standard, aristotelian thesis. Writing will be defined as a general-purpose visual code for asynchronous communication. It is distinct from both sign language (which is attached to synchronous communication) and specialised graphic codes. I will offer a conjecture as to why general-purpose codes for asynchronous communication tend to be backed by a natural language.

Key words: writing, language, semiotics

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Affect and Metacognition: Confidence (in)Sensitivity When Feeling Happy

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The relationship between positive affect and metacognition has been scarcely studied. The present research examined the influence of induced positive affect on metacognitive processes while answering challenging general knowledge questions. Participants were induced with positive or neutral affect by a picture-tagging task. Based on previous findings, we expected positive affect to facilitate memory search and boost confidence compared to a neutral affective state. Our aim was to examine whether this confidence boost would reliably reflect task-related performance fluctuations. Two manipulations took place for influencing performance without effecting actual knowledge: answering format and social motivation. We hypothesized that positive affect will generate insensitivity of confidence ratings to task-related performance fluctuations. All predictions were supported. In particular, positive affect did enhance performance and confidence relative to the neutral affect. However, compared to the neutral affective state, under positive affect participants exhibited larger overconfidence and were less sensitive to performance fluctuations. Our results suggest that although positive affect facilitates cognitive performance, it impairs metacognitive monitoring. Practical and theoretical implications for both affect and metacognition bodies of literature are discussed.

Key words: positive affect, metacognitive monitoring, general knowledge, overconfidence

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Saturday (May 23), 10:30–11:30

The Roles of Intention and Belief on Mood

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My empirical study was set to explore whether eating apples blessed by Hare Krishna would enhance mood more than eating ordinary apples and how belief on which apples you receive influence your mood. 20 participants were randomly assigned into two groups, one receiving blessed and one non-blessed apples, which was not revealed until after the experiment. They filled out a questionnaire before eating apples which measured sensory processing sensitivity, an impact of their mindset on their mood, religious and paranormal beliefs, their mood in that moment and general likeness of apples. After eating given apples they indicated which apples they thought they received and filled out the PANAS questionnaire, measuring their mood just after receiving apples.

Analysis of the results is still in the process. Participants are to be divided into four groups, depending on which kind of apples they received and on their beliefs of which apples they have received. My hypothesis is that apples treated with good intention improve mood more than ordinary apples and that belief and intention interact, meaning that belief that one is eating a blessed apple improves mood more if the apple is truly blessed.

Key words: intentional food, mind-set, belief, mood

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Metacognition at a collective level

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Metacognition, understood as the epistemic self-evaluation of cognitive processes, enables humans to prospectively predict the outcome of mental actions and retrospectively decide whether a performed mental action was successful. Since many philosophers have argued that cognition can also be identified at a level 'above the individual', namely at a distributed or collective level, it is worth asking whether the possibility of being distributed or collective also applies to metacognition. I.e., are there any forms of collective or distributed epistemic self-evaluations that let collectives or distributed systems somehow control and monitor their cognitive processes? List and Pettit have argued that group reasoning is only possible within an 'informal organizational structure' and that explicit and formal organizational structures can only establish e.g., consistency by aggregating individual beliefs through a special way of voting. Contra List and Pettit I

Saturday (May 23), 10:30–11:30

argue that a (metacognitive) deliberative process can also be a vital part of 'explicit organizational structures' because the process of generating individual beliefs, upon which the collective beliefs supervene, is not an individualistic and isolated truth tracking mechanism but a collective exchange of arguments. The metacognitive function of a collective is then realized through deliberation before voting to generate a group belief.

Key words: Collective Metacognition, Distributed (Meta-)cognition

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On the cognitive biases as cognitive territories outside positive manifold continent

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Study was aimed to address questions of generality of individual differences in cognitive biases and their reducibility to other well-known cognitive measures. Heterogeneous set of seven cognitive biases was selected (belief bias, anchoring effect, overconfidence bias, hindsight bias, outcome bias, base rate neglect, and sunk cost effect) and tests for the measurement of individual differences in these biases were designed. They were computer administered to participants (N=243) together with Raven's Matrices, Swaps, 3D Space, Vocabulary, Analogies, Synonyms-Antonyms, Need For Cognition, Intellect/Openness, and Cognitive Reflection Test.

Mean bias scores deviated from normative values by between 1.64 and 3.58 standard deviations, indicating large effects of normatively irrelevant variables. Cronbach's alphas were above .70 for all measures but hindsight bias, thus suggesting that individual differences in susceptibility to cognitive biases can be reliably measured. However, their generality was very low. Correlations among bias measures were small ($r's < .20$) and both positive and negative. Also, only some of them were related to measures of intelligence and CRT ($r's < .25$), none was related to NFC and O/I. In sum, results indicate that main part of reliable variance in susceptibility to cognitive biases is unique and support the conclusion that processes captured by cognitive biases are diverse.

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Saturday (May 23), 10:30–11:30

The development of metacognitive monitoring-control processes in adolescence

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The interplay between metacognitive monitoring and control improves during childhood, such that 9- but not 6-year old children allocate more study time to difficult than to easy learning pairs. The current study explored whether such self-regulation continues to develop in adolescence and whether participants perform differently under self-paced and timed conditions. We tested a group of 10- (N=31) and 14-year olds (N=29) and adults (N=29) in a within-subjects design. In each of two consecutive blocks, participants first monitored their learning of easy and difficult picture pairs through Judgments of Learning (JoL) and then studied the first set of pairs in a self-paced manner and the second set of pairs under time pressure. Results showed that in both conditions all age groups allocated more study time to items with low than with high JoL. The return-rate of learning (proportion of items correct/time invested) showed that adults studied in a more efficient manner compared

to 10- and 14-year olds. Moreover there was a higher learning rate in the timed, compared to the self-paced condition for all age groups. These results suggest that efficient study time allocation continues to develop in adolescence and that even adults labour in vain when time is abundant.

Research funding from the National Research Fund Luxembourg and partly from a European Research Council (ERC) advanced grant (Project 269616).

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When problem solving meets metacognition: thinking about writing before doing it.

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Introduction:

Writing is a complex task requiring the triggering of problem solving abilities (Alamargot & Chanquoy, 2001). The role metacognition plays on the written processes has met little attention within this field of research, with few exceptions.

Goal of the experiment: This study addresses the following questions : can primary school children develop metacognitive knowledge about writing? It predicts that encouraged to develop metacognitive knowledge about writing, young children should manage to integrate such knowledge into their productions.

Method:

Saturday (May 23), 10:30–11:30

Subjects: Third, Fourth and Fifth graders participated to this study and were divided into experimental and control group.

Material: 4 metacognitive questionnaires on the process of writing for the experimental group. 4 questionnaires about the writing process for both groups.

Procedure: Before answering to the open questions about writing experimental group children had to mark their agreement/disagreement with the statements within each metacognitive questionnaire which aimed at developing their metacognitive awareness and knowledge about writing.

Results:

Results show that the children within the experimental group became metacognitively aware, and they integrated such metacognitive knowledge into their answers to the questions. Compared to the control group, the experimental group integrated a higher number of metacognitive items into their productions.

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The Effect of Explicit and Implicit Category Learning on Classification Accuracy and Confidence

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The aim of study was to investigate how activation of explicit and implicit categorization systems during learning affects classification accuracy and confidence judgments in the later test phase. One group of participants was informed about the correct classification rule at the beginning of the learning phase (rule condition). Another group was never informed about the rule (no-rule condition).

In the test phase, old and new items were presented. New items differed from the old items with respect to transfer type (good or bad) and item consistency (consistent or inconsistent). Good transfer items belonged to the same category as their old twin item, while bad transfer items belonged to the opposite category. Consistent items were highly similar to their old twins, while inconsistent items were less similar.

In the rule condition, the results showed that neither transfer type nor item consistency affected classification accuracy or confidence judgments. In the no-rule condition, the results showed that transfer type affected accuracy, but not confidence. On the other hand, item consistency affected confidence but not accuracy. The results suggest that explicit category learning system is activated in

Saturday (May 23), 10:30–11:30

the rule condition, while implicit category learning system is activated in the non-rule condition.

Key words: category learning systems, classification accuracy, confidence judgments

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