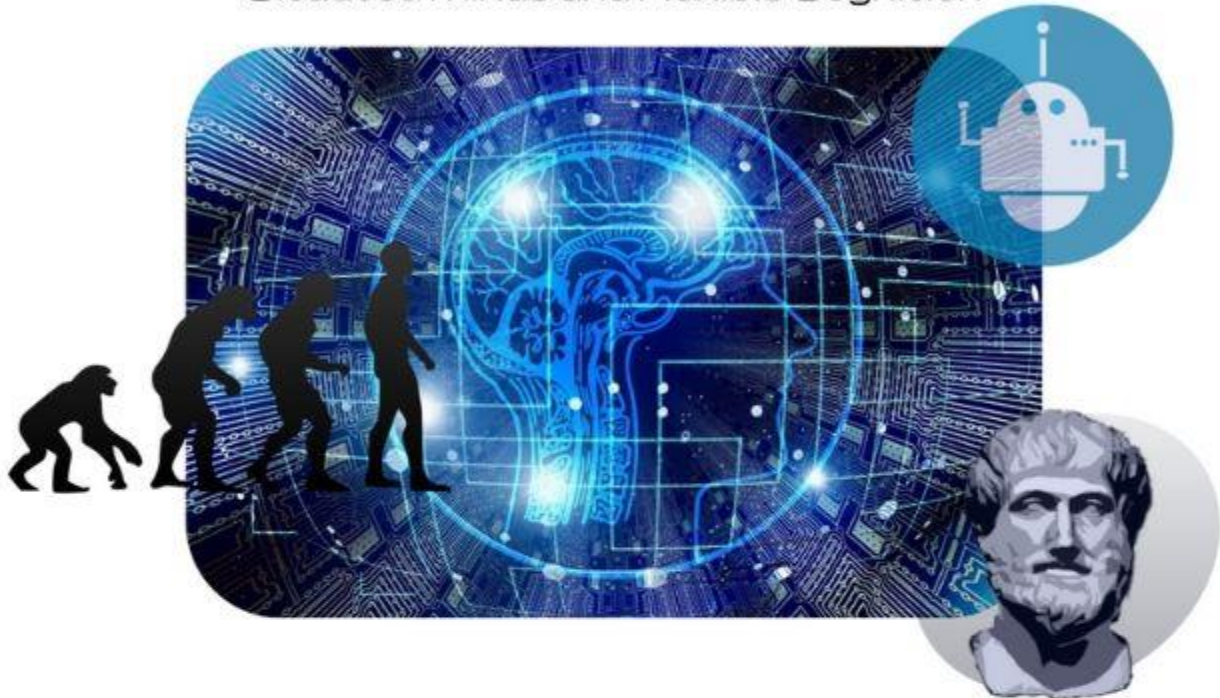# EUROCOGSCI 2019

Situated Minds and Flexible Cognition

02. - 04.09.2109
Ruhr-Universität Bochum
Main organizer: Prof. Dr. A.Newen.

RUHR UNIVERSITÄT BOCHUM

RUB

GK

DFG Deutsche Forschungsgemeinschaft
German Research Foundation

Center Mind Cognition

RUB RESEARCH SCHOOL

Content

PROGRAM EUROPEAN CONFERENCE FOR COGNITIVE SCIENCE 2019

	MONDAY, 02.09.2019					
08:00 – 08:45	REGISTRATION					
08:45-09:00	WELCOME SPEECH					
09:00 -10:00 (Saal 2a)	**LAWRENCE BARSALOU** The Situated Assessment Method (SAM2): A New Approach to Measuring, Understanding and Predicting Health Behaviors					
10:00 -10:30	Coffee break					
	INVITED SYMPOSIUM I (Saal 2a)		CONTRIBUTED SYMPOSIUM I (Saal 2b)		CONTRIBUTED SYMPOSIUM II (Saal 1)	
10:30 -12:30	Situated Robotics 10:30 Minoru Asada (University of Osaka) 11:30 Etienne Burdet (University of London)		The Logic and Cognitive Science of Inferential Conditionals		Cognition in Biological Systems	
12:30 -14:00	Lunch					
	Parallel Paper Sessions 1-6					
	PPS1 **SELF** (Saal 1)	PPS2 **SOCIAL COGNITION, MENTAL DISORDERS and EMOTIONS** (Saal 3)	PPS3 **SITUATED COGNITION and LANGUAGE** (Saal 4)	PPS4 **DEVELOPMENTAL and COMPARATIVE PSYCHOLOGY** (Saal 2b)	PPS5 **DECISION MAKING** (Saal 5)	PPS6 **LANGUAGE** (Saal 2a)
14:00 -14:30	J. C. Espejo-Serna "The Sense of Ownership in Bodily Awareness as a Sense of Space"	E. Lancellotta "Are Clinical Delusions Adaptive? The Case of OCD"	V. Kulikov "A Mathematical Approach to Enactivism"	A. Rosas "Trapping vs. Trusting: Joint Attention and Common Knowledge in Apes and Human Infants"	F. Grabenhorst "Primate Amygdala Neurons Simulate Decision Processes of Social Partners"	M. Spychalska "Order and Relevance: Revising Temporal Structures"
14:30 -15:00	F. Martinez-Manrique "The Problem of Self-Deception Acknowledgment"	A. Suffel "The Neural Processing of Gesture and Body Orientation in	O. Morin "Reverse Engineering Cash"	J. Wolf "Finding a Point of View: The Role of Self and Others in	T. Otto "The Associative Property Holds for Combination of Auditory, Visual and	P. Cuevas "Age Related Effects on the Neural Processing of Semantic Complexity

		Patients with Major Depression"		Understanding Perspectives"	Tactile Signals in Multisensory Decisions"	in Continuous Narrative Accompanied by Gestures"
15:00 -15:30	M. Košová "True Self Behind the Face of the Future"	A. Stephan "Emotions Beyond the Brain: Varieties of Scaffolded Affectivity"	T. N. von Heiseler "Indexicals Signaling in the Evolution of Language"	A. Hohenberger "Inquiry As an Insightful Tool to Enhance Children's Tool Innovation Ability"	S. Achter "Judgmental Forecasting in a Complex Supply Chain Environment"	J. Erdmann "Examining Spon-taneous Recovery Effects in German Orthography Instruction Methods"
15:00 -16:00	T. Szubart "Who Is It in the Mirror? DRT and De se Attitudes"	A. Fiebich "In Defense of a Pluralist Theory"	O. Alacam "Syntactic and Semantic Disambiguation in a Situated Language Setting"	E. Andonova "Grammar and Biology and Preschoolers"	D. Chakarova "Relational Models and Cooperation in Prisoner's Dilemma Game"	S. Fuchs "The Effect of Different Types of Physical Activity on the Temporal Organization of Speech"
16:00 -16:30	Coffee break					
16:30 -17:30 (Saal 2a)	**ASIFA MAJID** Language, Culture and Perception					
17:30 -19:30	**Poster Session and Reception**					

SYMPOSIA SPEAKERS:

SITUATED ROBOTICS: Minoru Asada (University of Osaka), Etienne Burdet (University of London).

THE LOGIC AND COGNITIVE SCIENCE OF INFERENTIAL CONDITIONALS: Shira Elqayam (University of Leicester), Igor Douven (University of Paris), Robert van Rooij (University of Amsterdam), Katrin Schulz (University of Amsterdam), Vincenzo Crupi (University of Turin), Niels Skovgaard-Olsen (University of Göttingen).

COGNITION IN BIOLOGICAL SYSTEMS: Fred Keijzer (University of Groningen), Rosa Cao (University of Stanford), Marc Artiga (University of Valencia).

PROGRAM EUROPEAN CONFERENCE FOR COGNITIVE SCIENCE 2019

	TUESDAY, 03.09.2019					
09:00 - 10:00 (Saal 2a)	**BRIAN MCLAUGHLIN** Mid-Level Visual Perception and a Puzzle about Geometrical Visual Illusions					
10:00 - 10:30	Coffee break					
	INVITED SYMPOSIUM II (Saal 2a)		CONTRIBUTED SYMPOSIUM III (Saal 2b)		CONTRIBUTED SYMPOSIUM IV(Saal 1)	
10:30 - 12:30	Theory of Mind and Its Developments 10:30 Ágnes Melinda Kovács (University of Budapest) 11:30 Albert Newen (University of Bochum)		Concepts and Reasoning in Mathematics: Neural, Behavioral and Philosophical Perspectives		Explainable Intelligent Systems and the Trustworthiness of Artificial Experts	
12:30 - 13:30	Lunch					
13:30 - 15:30	Poster Session and Coffee					
	Parallel Paper Sessions 7-12					
	PPS7 **ACTION** (Saal 1)	PPS8 **PHILOSOPHY OF MIND** (Saal 3)	PPS9 **CONCEPTS and REPRESENTATION** (Saal 5)	PPS10 **ROBOTICS** (Saal 4)	PPS11 **MORAL and CAUSAL REASONING** (Saal 2b)	PPS12 **LANGUAGE** (Saal 2a)
15:30 - 16:00	A. Solfo "On the Founding Role of Coordination in Constituting Agency"	M. Niemeck "The Subjective Character of Experience and Impure Intentionalism"	M. Kohar "Dual Explananda: Why A Popular Defence of Representationalism Fails"	A. Weidemann "Investigation of Frustration Towards Productive Human-Robot Interaction"	J. Wagner "Making Sense of Right and Wrong: Enactivism and Experiences of Normativity"	N. Althaus "Dissimilar, but Not Similar, Labels Promote Infant's Category Learning"
16:00 - 16:30	L. Kirfel "I Know What You Did Last Summer (and How Often): Epistemic States and Statistical Normality in Causal Judgment"	M. Pantsar & R. Fabry "A Fresh Look at Research Strategies in Computational Cognitive Science: The Case of	D. Coelho-Mollo "The Teleocomputational View of Representation"	D. Ghiglino "Human Sensitivity To Subtle Hints of Human-Likeness in Humanoid Robot's Behavior"	J. Bergold "Moral Judgment in Children"	E. Fischer "Salience Bias in Polisemy Comprehension: Effects on Judgment and Reasoning"

		Enculturated Mathematical Problem-Solving"				
16:30 - 17:00	S. Kahl "How Active Inference can Facilitate Belief Coordination in Multi-Agent Interaction"	J. Ochs "The Common Competence Characterization of the Expressive-Epistemic Relation in Mature Neurotypical Humans"	G. Löhr "Simulations, abstract concepts and copredication"	P. Beckerle "Cognitive Aspects of Assistive Robotics: A Technical Discussion"	N. Engelmann "Moral Reasoning with Multiple Effects"	M. Choo "Relatedness-of-Definition Effects on Semantic Categorization"
17:00 -18:00 (SAAL 2A)	JULIA FISCHER COGNITION IN THE WILD					
19:30 - 21:30	Dinner					

SYMPOSIA SPEAKERS:

THEORY OF MIND AND ITS DEVELOPMENTS: Ágnes Melinda Kovács (University of Budapest), Albert Newen (University of Bochum).

CONCEPTS AND REASONING IN MATHEMATICS: NEURAL, BEHAVIORAL AND PHILOSOPHICAL PERSPECTIVES: Véronique Izard (University of Paris), Yacin Hamami (University of Brussel), Marie Amalric (University of Pittsburgh), Valeria Giardino (CNRS France).

EXPLAINABLE INTELLIGENT SYSTEMS AND THE TRUSTWORTHINESS OF ARTIFICIAL EXPERTS: Timo Speith (University of Saarbrücken), Eva Schmidt (University of Saarbrücken), Andreas Sesing (University of Saarbrücken), Tina Feldkamp (University of Saarbrücken).

PROGRAM EUROPEAN CONFERENCE FOR COGNITIVE SCIENCE 2019

	WEDNESDAY, 04.09.2019					
09:00 - 10:00 (SAAL 2A)	**NATALIE SEBANZ** — MINDS IN JOINT ACTION					
10:00 - 10:30	Coffee break					
	INVITED SYMPOSIUM III (SAAL 2A)		**CONTRIBUTED SYMPOSIUM V (SAAL 2B)**		**CONTRIBUTED SYMPOSIUM VI (SAAL 1)**	
10:30 - 12:30	EVOLUTIONARY ROBOTICS AND NEURO-ROBOTICS 10:30 Dario Floreano (EPFL Lausanne) 11:30 Patricia A. Vargas (University of Edinburgh)		LOSING OUR GRIP: PSYCHOPATHOLOGY AND EMBODIED PREDICTIVE PROCESSING		CONDITIONS AND CONSEQUENCES OF ADOPTING INTENTIONAL STANCE TOWARD OTHER AGENTS	
12:30 -14:00	Lunch					
14:00 -15:00 (SAAL 2A)	**JOHN SPENCER** — THE EARLY DEVELOPMENT OF VISUAL WORKING MEMORY					
	Parallel Paper Sessions Paper 13-17					
	PPS13 **REASONING and MIND** (SAAL 4)	PPS14 **CONCEPTS** (SAAL 3)	PPS15 **ACTION** (SAAL 1)	PPS16 **PERCEPTION** (SAAL 2B)	PPS17 **LANGUAGE** (SAAL 2A)	PPS 18 **PHIL. OF MIND and SCIENCE** (SAAL 5)
15:00 - 15:30	B. Krickel "Are There Unconscious Mental Phenomena? Five Challenges for the Empirical Investigation of the Unconscious Mind"	F. Calzavarini "The Conceptual Format Debate and the Supramodal Brain"	B. Wahn "Group Benefits in a Collaborative Multiple Object Tracking Task"	A. Raftopoulos "How Do Cognition and Perception Interact?"	H. Mallot "Language Cues in the Formation of Hierarchical Representations of Space"	A. Downey "Enactive Fictionalism: A Better Alternative to Eliminative Materialism"
15:30 - 16:00	K. Rudnicki "How Do Human Brains Process the Liar Paradox? A New Imaging Study as	B. Ippedico "Towards a Lineage Explanation of our Conceptual System"	J. Lohmann "Grasping Uncertainty: A Free Energy Approach to	M. Bucciarelli "The Role of Emotions in Deontic Beliefs"	M. Werning & M. Unterhuber "Relevance vs. Similarity: Bayesian	L. Bucher "Uncertainty in Science: A Study on the Role of

	a Test for the Virtual Entailment Principle"		Anticipatory Behavior Control"		Pragmatics Provides the Best Quantitative Model for EEG and Cloze Data on Contextual Modulation in a Predictive Completion Task"	Non-Cognitive Values in the Assessment of Inductive Risk
16:00 - 16:30	G. Garofalo "Is Color an Integral Part of Object Motor Representation?"	D. Dessaix "What Does it Take to Be a Primitive Concept? Separating Innateness from Foundationalism"	M. Scott "Agency and Temporal Shift Disrupted by Startle"	M. Martinez "Ecological Information is Not Sufficient for Direct Perception"	B. Grusdt "Probabilistic Modeling of Rational Communication with Conditionals"	
16:30 - 17:00	Coffee break					
17:00 - 18:00 (SAAL 2A)	PATRICK HAGGARD VOLUNTARY ACTION AND CONSCIOUS AWARENESS					

SYMPOSIA SPEAKERS:

EVOLUTIONARY ROBOTICS AND NEURO-ROBOTICS: Dario Floreano (EPFL Lausanne), Patricia A. Vargas (University of Edinburgh).

LOSING OUR GRIP: PSYCHOPATHOLOGY AND EMBODIED PREDICTIVE PROCESSING: Julian Kiverstein (University of Amsterdam), Jelle Bruineberg (University of Amsterdam), Mark Miller (University of Edinburgh), Regina E. Fabry (University of Bochum).

 CONDITIONS AND CONSEQUENCES OF ADOPTING INTENTIONAL STANCE TOWARD OTHER AGENTS: Tobias Schlicht (University of Bochum), Agnieszka Wykowska (IIT Genova), Kai Vogeley (University of Cologne)

Poster Session I - Mo. 02.09.19, 17.30 - 19.30

No. / Title of poster   Contributor/s

1. A bi-dimensional model of subjective agency   Antonella Tramacere

2. Aesthetic experience as affective action control in an ideomotor approach by positive/negative feedback about the   Klaus Schwarzfischer
   quality of cognitive modelling

3. xxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxx   xxxxxxxxxxxxxxxxxxxxxxxxxxxxxx

4. Motor-sensory recalibration for motor-auditory and motor-visual events   Belkis Ezgi Arikan et al.

5. On the ideomotor principle of goal-directed automaticity of habits: Evidence for spontaneous action-outcome learning   Dan Sun et al.

6. The impact of predictions and sensory input on the sense of agency: Development of a new psychophysical paradigm   Hiroaki Mizuhara et al.

7. The temporal dynamics of action-effect prediction: An EEG study   Elisabeth Lindner et al.

8. Using neurofeedback to study the effects of inter-brain synchronization on joint action performance   Marius Zimmermann et al.

9. Vicarious sense of agency in human-robot interaction   Cecilia Roselli et al.

10. What is agency? An empirically informed minimal account.   Florian Teichmann

11. Modelling ad hoc concepts in conceptual space : An introduction   Davide Coraci

12. Some possibilities for axiology in AI   Wanja Wiese

13. The relationships of overlap and containment in the semantic hypernetwork   Kaoutar Skiker et al.

14. The neurocognitive soliton (NCS) hypothesis — Harald Maurer

15. Age-dependent influences of general anaesthesia on the cognitive abilities in long-tailed macaques (Macaca fascicularis) — Lena Jeanson

16. Molyneux's fish – object features in active electroception — Thede Witschel et al.

17. Social comparison in long-tailed macaques - Competition is key — Rowan Titchener

18. Coordinating investigations in the field of cognitive anthropology — Benjamin Reimann

19. A new interactive task to study early false belief understanding. — Lisa Wenzel et al.

20. When do children appreciate the subjectivity of desires? — Lydia Paulin Schidelko et al.

21. Children's associations between space and numbers can be biased by physical size — Sarah Dolscheid et al.

22. Grasping numbers without our hands — Jean-Charles Pelland

23. How young minds see future minds: Uncanny valley and ascription of different types of attributes to robots — Robin Kopecky et al.

24. The cognitive-development approach to event cognition: Age differences in detection of event boundaries and in creation of event models — Vladimir Glebkin et al.

25. The developmental trajectory of left-side bias in faces and chinese characters processing: Evidence from an ERP study — Chenglin Li et al.

26. Autonomic regulation for go-no-go task in children with ADHD — Sofia Polevaia et al.

27. Neurofeedback from subject's EEG for correction of stress induced states — Sofia Polevaia et al.

28. Distributed representations - The importance of eye movements in mental problem solving — Marcel Dorer et al.

29. The influence of spatial frequencies on navigation by visual guidance — Lilian Levinh et al.

30. A new connectionist model for grounding spatial prepositions — Igor Farkas et al.

31. Immunization against data in resource-constrained observers — Marcel Binz et al.

32. Neural principles for modeling relational reasoning: Lesson learned from cognitive neuroscience — Julia Wertheim et al.

33. Adapt or exchange: Supporting decisions in modular plants with process relations or cases — Romy Müller et al.

34. How bias-resistant are moral philosophers? — Alexander Wiegmann et al.

35. Inferring subjective belief formation from small samples in sequential human decision making under conscious uncertainty — Thomas Wiebringhaus

36. Moral judgments in trolley and footbridge dilemmas: An eye tracking study — Evgenia Hristova

37. Quantum measurement effects in decision making — Charlotte Hohnemann et al.

38. Eye scan patterns in problem solving — Samantha Stranc

39. Towards a comprehensive taxonomy of study goals of university students — Felix Weber et al.

40. A paradigm to investigate speech-gesture integration in patients with schizophrenia – implications for the use in a multimodal training intervention — Lydia Riedl et al.

41. Accounting for contextual modulation in Arabic by a Bayesian pragmatic model — Matthias Unterhuber et al.

42. Action-thoughts and the origin of meaning — Andrew Simsky

43. Is the modifier effect explained by rational reasoning? — Corina Strößner et al.

Poster Session II - Tue. 03.09.19, 13.30 – 15.30

No. / Title of poster	Contributor/s
44. Causal role of sensorimotor cortices in word recognition following sensorimotor-enriched vocabulary learning	Brian Mathias et al.
45. Children's ability of spatial thinking is related to observer viewpoints in iconic co-speech gestures	Ulrich Mertens et al.
46. Differences in the mental representation of verbs in Germans and Koreans: Categorizing using the semantic differential	Min-Kyung Kim et al.
47. Gender is a flexible concept: A comparison of Italian and Dutch	Claudia Mazzuca et al.
48. Generation frequency of words in different levels of second language acquisition	Olga P. Marchenko
49. Is lying bound to what is said? Empirically investigating deceptive presuppositions, implicatures, and actions.	Louisa Marie Reins et al.
50. Mechanisms of adult word learning: How temporal congruency and object modality affect word learning	Samuel H Cosper et al.
51. Modelling predictions at the sentence-level	Maxime Corbeil
52. The implication of working memory in gesture/speech integration: Validation study of iconic gesture videos among French speakers	Kendra G. K. Arachchige et al.
53. Understanding the role of linguistic distributional knowledge in cognition: A systematic comparison of tasks, models and parameters	Cai Wingfield et al.
54. When words are upside down. Signatures of embodied language comprehension in young children.	Anne Vogt et al.
55. Inheritance Inference from an ecological perspective	Paul Thorn et al.
56. Is space special? The role of spatial information in analogical reasoning, problem solving, and decision making.	Holger Schultheis et al.
57. Revision operator semantics	Eric Raidl

58.	The role of effect and sample size in causal induction	Simon Stephan
59.	"If you gesture I can't forget what you say": Co-speech gestures obstruct intentional forgetting	Francesco Ianì et al.
60.	Categorical working memory representations in jackdaws (Corvus monedula)	Aylin Klarer et al.
61.	Examining the cognitive and metacognitive mechanisms of productive failure in a non-STEM Learning Setting	Valentina Nachtigall et al.
62.	Familiarity interferes in the recognition and nature of the memorized representation, not in the process of retrieval	Isabella W. Pucci
63.	Negative mood improves verbal, but nor visual reasoning task	Livia Valenti et al.
64.	Running during encoding improves word learning for children	Gianluca Amico et al.
65.	Applying false belief ascription when it really matters: Children's failure to include false beliefs when ascribing intentions	Britta Schünemann et al.
66.	Moral judgments about dilemmas in the context of war	Juan C. M. Hernández et al.
67.	Pragmatic effects in adults' false belief evaluation	Rachel Dudley et al.
68.	Self-knowledge as a result of the embodied and social cognition	Anita Pacholik-Żuromska
69.	Social cognition and uncanny valley	Emre Yorgancıgil et al.
70.	Process philosophical considerations of human cognition and artificial intelligence	Domenico Schneider
71.	When do we attribute mental states to others and oneself adequately?	Adrianna Smurzyńska
72.	'Essence' is therefore an intuition	Kiran Pala
73.	From a cognitive philosophical point of view	Andreas Stephens et al.

PROGRAM EUROPEAN CONFERENCE FOR COGNITIVE SCIENCE 2019

74. Human visual consciousness, representations, and actions — Mikhail A. Sushchin

75. Sensory models. Rethinking representational status — Adrian Wieczorek

76. The blind variation and selective retention (BVSR) theory and the language of thought — Pauli Laine

77. The discrete form of consciousness and the illusion of continuity: An fMRI case study on music imagery as a roadmap — Morteza Izadifar

78. The natural ego-center: an experimental account to locate the inner self — Sarah Schäfer et al.

79. A cognitive model for the takeover task in complex environments for highly automated driving — Nele Rußwinkel et al.

80. Curiosity-based exploration in the proprioceptive space of a humanoid robot — Yasmin Kim Georgie et al.

81. Towards identifying important research topics: A prioritisation framework to cognitive science — Shiva Pauer et al.

82. Affordances and ill-defined problem solving: A perspective from situated cognition — Pankaj Singh et al.

83. Can valence-verticality metaphor incongruence facilitate people's memory? — Zixi Jin et al.

84. Influence of the perspective on the spatial interpretation of pointing gestures — Lisa-Marie Krause et al.

85. Spatial processes in category assignment — Ulrich von Hecker et al.

86. The perspective determines the production and perception of pointing gestures — Oliver Herbort et al.

87. Learning therapist's conversation skills and changes in hand movement activation — Katharina C.H. Reinecke et al.

88. Looking out for synchrony: Effects of expertise and experience on visual attention in spectators watching a video recording of William Forsythe's choreography „Duo" — Bettina Bläsing et al.

89. Perception – Distance estimation of traffic participants — Julia Bastian

ABSTRACTS

ABSTRACTS
KEYNOTE TALKS
(temporal order)

PROGRAM EUROPEAN CONFERENCE FOR COGNITIVE SCIENCE 2019

THE SITUATED ASSESSMENT METHOD (SAM²):

A NEW APPROACH TO MEASURING, UNDERSTANDING, AND PREDICTING HEALTH BEHAVIOURS

Lawrence Barsalou, Institute of Neuroscience and Psychology, University of Glasgow

Abstract: Based on theories of situated cognition and embodiment in cognitive science, the Situated Assessment Method (SAM²) offers a theoretically motivated approach for measuring health behaviours at both the group and individual levels. Rather than attempting to capture a health behaviour with general items that abstract over relevant situations (as in standard self-report instruments), SAM² assesses two situated dimensions. First, SAM² establishes the specific situations associated with an individual's behaviour in a health domain. Second, SAM² samples features from the situated action cycle that attempt to predict the behaviour across situations. As a result, SAM² establishes overall measures of a health behaviour grounded directly in situational experience, along with features of the situated action cycle that predict the behaviour. In recent studies, we have found that SAM² does an excellent job of predicting health behaviours associated with habits, eating, stress, mindfulness, and trichotillomania (compulsive hair pulling). Using mixed effects models, SAM² typically explains 60 to 80% of the variance at the group level and more variance at the individual level, demonstrating large systematic individual differences. In addition, SAM² represents individual differences in an explicit manner that has potential for supporting individuals as they understand and work with a health behavior. Issues associated with causality, explicit vs. implicit measures, and external validity are important to address.

LANGUAGE, CULTURE, AND PERCEPTION

Asifa Majid, University of York

Abstract: There are few more compelling questions in cognitive science than whether people across the globe perceive and think about the world in the same way. Language has the potential to offer insights on this. Numerous studies have shown that different communities package information into words and grammar in different ways, and this differential coding can lead to concomitant differences in cognition and perception. Despite these effects of language on perception, it is clear that perception is partly independent of language too, with some aspects of perception being more amenable to linguistic expression than others. For example, English has distinct words for simple geometric shapes, but smells seem to resist precise description. In this talk, I review data from diverse cultures worldwide to illustrate the multifaceted relationship between language and perception.

MID-LEVEL VISUAL PERCEPTION AND A PUZZLE ABOUT GEOMETRICAL VISUAL ILLUSIONS

Brian P. McLaughlin, Philosophy Department and Center for Cognitive Science, Rutgers University

Abstract: Ken Nakayama has made a strong case that there is mid-level visual perception. Mid-level visual percepts are the outputs of low-level vision and inputs to high-level vision. They represent a layout of surfaces at various distance from the perceiver and at various angles to the line of sight, often with some surfaces partially occluding others. I appeal to the notion of mid-level vision to argue that that there are two inverse optics problems, not just one as the tradition since Helmholtz has claimed. Then, I raise a puzzling question about geometrical visual illusions. I attempt to dissolve the puzzle by making a case for a certain hypothesis about the representational capacities of mid-level percepts. Mid-level percepts represent only relative geometrical properties, not absolute ones. They represent lengths, for instance, in a unit-free way. This fact, I argue, dissolves the puzzle.

Cognition in the Wild

Julia Fischer, University of Göttingen

Abstract: What do nonhuman primates know about each other and their environment, how do they allocate their attention, and what are the functional consequences of social decisions in natural settings? Addressing these questions is crucial to hone in on the co-evolution of cognition, social behaviour and communication, and ultimately the evolution of intelligence in the primate order. I will present results from field experimental and observational studies on Guinea baboons and West African green monkeys that tap into the cognitive abilities of these animals. Baboons are particularly valuable in this context as different species reveal substantial variation in social organization and degree of despotism. Field experiments in two baboon species that constitute the extreme of the variation in social system characteristics revealed considerable variation in what the animals appear to consider meaningful, while the content of their social knowledge is comparable. I will further present a study which revealed that monkeys may show extremely rapid learning in the wild, while they may fail (utterly) in comparable lab studies. In summary, studying cognition in the wild forms an important complement to lab based experimental studies, because they tap into what is meaningful for the animals under valid ecological and evolutionary conditions.

MINDS IN JOINT ACTION

Natalie Sebanz, CEU, Budapest

Abstract: Humans are able to perform a wide range of joint actions, from carrying heavy objects together to having conversations. What are the mechanisms enabling joint action? This talk will provide an overview of research that has begun to unravel the behavioural, cognitive, and neural processes supporting joint action planning and coordination. On the one hand, philosophers of action have stressed the importance of forming shared intentions. On the other hand, research inspired by ecological psychology and dynamical systems has stressed the importance of informational coupling mechanisms that support emergent behavioural coordination. The focus on planning on the one hand and coordination on the other raises an important question: How are planning processes and coordination processes linked? Recent research in cognitive psychology and cognitive neuroscience provides some answers to this question. While much of this research has focused on egalitarian dyadic joint actions, new findings also shed light on role and task distributions in more complex group contexts. It will be discussed what we can learn from joint action research for increasing affiliation and cooperation, for improving the design of collaborative robots, and for enhancing our understanding of aesthetic experiences during joint action observation.

THE EARLY DEVELOPMENT OF VISUAL WORKING MEMORY

John P. Spencer, University of East Anglia

Abstract: There is a growing need to understand the global impact of poverty on early brain and behavioural development, particularly with regard to key cognitive processes that emerge in early development. One such cognitive process is visual working memory (VWM). VWM is central to daily functioning, maintaining visual information actively in mind and detecting changes in the world when they occur. Here, I report initial findings from two large-scale studies examining the early development of VWM—one study from the UK and a parallel study conducted in Shivgarh, Uttar Pradesh, India, a region with some of the worst human developmental indictors in the world. We are using functional near-infrared spectroscopy (fNIRS) to collect neuroimaging data while infants and toddlers complete a Preferential Looking (PL) working memory task, and relating these functional neuroimaging data to structural MRI. We are also collecting data on a host of other cognitive, social, and environmental factors thought to impact the early development of brain and behaviour.

VOLUNTARY ACTION AND CONSCIOUS AWARENESS

Patrick Haggard, University College London

Abstract: Volition refers to a capacity for endogenous action, particularly goal-directed endogenous action, shared by humans and some other animals. It has long been controversial whether a specific set of cognitive processes for volition exist in the human brain, and much scientific thinking on the topic continues to revolve around traditional metaphysical debates about free will. At its origins, scientific psychology had a strong engagement with volition. This was followed by a period of disenchantment, or even outright hostility, during the second half of the twentieth century. In this review, I aim to reinvigorate the scientific approach to volition by, first, proposing a range of different features that constitute a new, neurocognitively realistic working definition of volition. I then focus on three core features of human volition: its generativity (the capacity to trigger actions), its subjectivity (the conscious experiences associated with initiating voluntary actions), and its teleology (the goal-directed quality of some voluntary actions). I conclude that volition is a neurocognitive process of enormous societal importance and susceptible to scientific investigation.

ABSTRACTS
SYMPOSIA
(temporal order)

Invited Symposium:
SITUATED ROBOTICS

Minoru Asada, University of Osaka
Etienne Burdet, University of London

Minoru Asada:
ARTIFICIAL PAIN – CAN A ROBOT HAVE A MORAL MIND?

Abstract: A working hypothesis proposed that the nervous system of pain sensation is a key component to shape robots' (artificial systems') conscious minds. The developmental process of empathy, morality, and ethics based on the MNS that promotes the emergence of concept of self (and others) scaffolds the emergence of the artificial minds. First, the limitation of the current progress of AI focusing on deep learning is pointed out from a viewpoint of the emergence of consciousness. Next, the outline of ideological background on issues of mind in a broad sense is shown. Then, artificial pain is introduced with its architectures in the early stage of self pain experiences and later in the sharing stage of the pain between self and others. Next, cognitive developmental robotics (CDR) is revisited with two important concepts; physical embodiment and social interaction both of which help to shape conscious minds. Following the working hypothesis, existing studies of CDR are briefly introduced and missing issues are indicated. Finally, an issue how robots (artificial systems) could be moral and legal agents is shown.

Etienne Burdet:
INTERACTION BETWEEN HUMANS AND WITH ROBOTS

Abstract: How do humans exchange haptic information through touch in order to coordinate their actions? How could robots optimally interact with human users? By examining the behaviours of individuals when their right hands are physically connected, we could show how haptic information enables humans to estimate partners' motor plan and use it to improve one own performance. Embodied as a robot partner, this model was verified as it induced the same improvements in motor performance as a human partner. We further elucidated how the sensory exchange is influenced by the interaction mechanics and how its benefits increase with the number of partners. These results elucidate the haptic communication taking place between physically interacting humans and promise collaborative robot systems with human-like assistance.

Contributed Symposium:

THE LOGIC AND COGNITIVE SCIENCE OF INFERENTIAL CONDITIONALS

Vincenzo Crupi, University of Leicester
Igor Douven, University of Paris
Shira Elqayam, University of Leicester
Katrin Schulz, University of Amsterdam
Niels Skovgaard-Olsen, University of Göttingen
Robert van Rooij, University of Amsterdam

Symposium Abstract: Conditionals ('if A, then C') play a central role in human argumentation and reasoning and are one of the main topics at issue in recent debates between mental model theory (Johnson-Laird and Byrne 2002; Khemlani, Byrne, and Johnson-Laird, 2018) and the so-called new Bayesian paradigm in the psychology of reasoning (Evans and Over, 2004; Oaksford and Chater, 2007). At least since Ryle (1950), there has however been an alternative approach to conditionals which differs from the above in emphasizing that A expresses a reason for C (or that an inferential relation between A and C persists). This approach to conditionals has been further developed in Rott (1986), Brandom (1994), Douven (2008, 2015), Spohn (2013), Olsen (2014), Krzyżanowska (2015), and van Rooij & Schulz (2018), and empirically supported in several recent psychological studies (e.g. Skovgaard-Olsen, Singmann, and Klauer, 2016; Douven, Elqayam, Singmann, and van Wijnbergen-Huitink, 2018; Skovgaard-Olsen, Collins, Krzyżanowska, Hahn, and Klauer, 2019). In this symposium, we bring together researchers with diverse backgrounds in philosophy, psychology, and linguistics to discuss the most recent developments in the inferential approach to conditionals. The contributions to the symposium consist in a combination of logical, conceptual, and empirical investigations of the inferential approach to conditionals.

Shira Elqayam & Igor Douven:

HYPOTHETICAL INFERENTIAL THEORY: A NEW THEORY OF CONDITIONALS

Abstract: We present a novel approach to conditionals, Hypothetical Inferential Theory (HIT), based on inferentialism and dual process theories. According to HIT, people evaluate conditionals by drawing an inference from antecedent to consequent. This inference need not be deductive, as long as reasoners can satisfice that it is strong enough. We present findings with abstract and content-rich conditionals that show that truth evaluations of conditionals are sensitive to factors that affect inference strength, correlate with evaluations of inference strength, and are susceptible to the same biases that affect other types of inference. Most

notably, we found a belief bias analogue in both abstract and realistic materials. Consistent with the New Paradigm, it is possible to see the Ramsey test as a 'first principle', which can be articulated in various ways. We depart, however, from previous proposals by articulating the Ramsey test in terms of inference strength rather than through the Equation.

Robert van Rooij & Katrin Schulz:
A CAUSAL ANALYSIS OF INDICATIVE CONDITIONALS

Abstract: The appropriateness, or acceptability, of a conditional does not just `go with' the corresponding conditional probability as once proposed by Adams and Stalnaker. A condition of dependence is required as well (cf. Douven, 2008, 2016; Skovgaard-Olsen et al., 2016). In this talk we propose a causal notion of dependence. It is shown that under both a forward causal and a backward evidential (or diagnostic) reading of the conditional, this appropriateness condition still reduces to conditional probability under some natural circumstances. We show that a very similar analysis can account for biscuit conditionals and conditional threats and promises as well.

Vincenzo Crupi:
THE LOGIC OF EVIDENTIAL CONDITIONALS

Abstract: Once upon a time, some thought that indicative conditionals could be effectively analyzed as material conditionals. Nowadays, an alternative theoretical construct prevails and receives wide acceptance, namely, the conditional probability of the consequent given the antecedent. Partly following earlier critical remarks made by others (most notably, Igor Douven), I advocate a revision of this consensus and suggest that incremental probabilistic support (rather than conditional probability alone) is key to the understanding of indicative conditionals and their role in human reasoning. There have been motivated concerns that a theory of such evidential conditionals (unlike their more traditional suppositional counterparts) cannot generate a sufficiently interesting logical system. I will present results largely dispelling these worries. Happily, and perhaps surprisingly, appropriate technical variations of Ernst Adams's classical approach allow for the construction of a new logic of evidential conditionals which is nicely superclassical, fairly strong, and potentially of consequence for empirical investigation.

Niels Skovgaard-Olsen:

LATENT TRUTH-TABLE CLASSES

Abstract: Despite much recent interest in inferential approaches to conditionals in the psychology of reasoning, many unresolved conceptual issues persist. For instance, *Cognitive Psychology* recently published one paper arguing that inferential relations are part of the truth-conditions of indicative conditionals (Douven, Elqayam, Singmann, and van Wijnbergen-Huitink, 2018), and another paper arguing that inferential relations are conventional implicatures of indicative conditionals but not part of their primary truth conditions (Skovgaard-Olsen, Collins, Krzyżanowska, Hahn, and Klauer, 2019). In this talk, the basis for both of these positions will be empirically contrasted.

PROGRAM EUROPEAN CONFERENCE FOR COGNITIVE SCIENCE 2019

Contributed Symposium:

COGNITION IN BIOLOGICAL SYSTEMS

Marc Artiga, University of Valencia
Rosa Cao, University of Stanford
Fred Keijzer, University of Groningen
Tobias Schlicht, Ruhr-University Bochum
Tobias Starzak, Ruhr-University Bochum

Symposium Abstract: Recent approaches to cognition have questioned about every feature of the traditional view that understands cognition in representational terms as information processing, with the brain as the locus of cognition. While some embodied and enactivist positions restrict the notion of representation to a very limited set of cases and argue that most instances of basic cognition are to be understood in non-representational terms, others extend the notion of cognition in a way that it applies to a wide spectrum of cases, including plants, insects, and bacteria. Moreover, it has been suggested to replace the *anthropogenic* approach that starts with human abilities as paradigmatic cases, with a *biogenic* approach that starts with the principles of biology from which essential features of cognition have to be derived. While these views put a spotlight on simple biological systems in the investigation of cognition, they also raise further questions like

- What is the relation of simple cognitive systems to more elaborate ones (animals with nervous systems etc.)?

- What are the implications of this approach for our view that cognition should be conceived of as information processing?

- What is the role of representations for minimal cognition? Where do we find representations? Which cognitive capacities require explanations in terms of representations?

- What is the role of brains and nervous systems for cognition?

- More generally: what is the function of nervous systems?

This symposium brings together perspectives from neuroscience, teleosemantics, and philosophy to address these questions.

Fred Keijzer:
BIOLOGICAL CASES OF COGNITION: MORE THAN MIND ALONE

Abstract: It is increasingly normal to encounter claims in the scientific and philosophical literature that cognitive processes occur in a broad variety of organisms and even in bodily tissues. Examples include the behavior of invertebrate animals and plants, but also slime molds, bacteria and the development and regeneration of animal bodies. The presence of cognition in these cases is taken to derive from the occurrence of features like perception, memory, decision-making and valuing. However, the claim that cognition is present in these cases remains controversial: Long-standing common-sense judgments concerning the close relation between cognitive processes and the human mind would exclude the examples just mentioned as *real* cases of cognitive phenomena. In reply, I want to challenge the relevance of such mind-oriented judgments for demarcating cognition as a scientific target domain and in particular for problematizing the cognitive status of these examples. Earlier work in the autopoietic, enactive and autonomy tradition already formulated interpretations of cognition that connect mind and life at a conceptual level. Here, I develop a more direct empirical connection that stresses the very presence of these biological cases. As they exist, unexpected though they may be, they are interesting and important empirical cases for the study of phenomena like perception, memory, decision-making and so on. It is not deeply relevant whether or not they fit current intuitive judgments about mind and cognition. They simply provide new empirical phenomena that should be taken seriously when it comes to the study of cognition.

Rosa Cao:
HOW TO BECOME COGNITIVE: A MODULAR GUIDE

Abstract: What distinguishes simple adaptive behaviors from more sophisticated cognitive capacities? One important difference is the possibility of behavioral *flexibility*, which arises in part from the degree of functional specialization and *modularity*. Modularity, understood as Simon's near-decomposability, is an evident feature of complex systems, and I'll argue that it's also an *enabling* feature for the ability of an organism to solve problems by employing *representations*, or using *information.*

This is because separation between internal processes, sensory inputs and behavioral outputs allows for the decoupling of behavior from stimulus – i.e. behavioral flexibility. Separation also allows for the (potential) decoupling of internal representations from any particular single physical cause, which makes more apt the characterization of the relevant internal processes in informational terms,

rather than purely causal or physical ones. Without functional separation, we see instead simpler capacities that fit more naturally into an enactivist paradigm, emphasizing the continuity of organism and environment.

Marc Artiga:
RADICAL LIBERAL REPRESENTATIONALISM

In the scientific literature, it is common to claim that some internal states of plants, insects or bacteria represent certain environmental features. But, should we take this representationalist talk at face value or is it just a mere *façon de parler?* How many biological systems possess genuine representations? This is not just a mere termi-nological quibble. Representations are supposed to play certain theoretical roles: among other things, representational states possess truth or accuracy conditions, contribute to explain the system's behavior and play an important role in trait indivi- duation. Furthermore, there is a close connection between carrying representations and qualifying as a cognitive system. Thus, the debate on the extension of this notion might have important theoretical consequences.

The mainstream view in philosophy rejects a liberal attribution of representations and restricts its use to relatively complex cognitive processes. This framework has recently been challenged by different kinds of anti-representationalism, which maintain that this approach is still too liberal, since many of the human cognitive capacities that were usually thought to involve representations actually do not employ them. In this paper, I will challenge the mainstream view in the opposite direction, by arguing that plants, insects and bacteria carry genuine, full-blown representational states. Accordingly, analogous to anti-representationalist 'Radical Enactivism' I call the view I will defend 'Radical Liberal Representationalism'.

More precisely, I will concentrate on a set of states that have been labeled 'detectors', 'receptors' or 'C-states', for which the anti-representationalist case is stronger. Receptors are internal states of organisms that are triggered by very specific cues (such as colors, shapes, odors and the like) and in normal conditions produce specific effects (usually some form of behavior). I will defend that receptors clearly fulfill the theoretical role that representational states are supposed to play. Furthermore, I will argue that the arguments for resisting a liberal attribution of representations are wanting.

Invited Symposium:

THEORY OF MIND AND ITS DEVELOPMENT

Ágnes Melinda Kovács, University of Budapest
Albert Newen, Ruhr-University Bochum

Ágnes Melinda Kovács:

WHAT INFERENCES INFANTS MAKE ABOUT OTHER MINDS? POSSIBLE COGNITIVE ARCHITECTURE AND PROCESSES

Abstract: Social interactions require powerful mechanisms for understanding others' goals, beliefs and desires. Despite extensive research, the development and the underlying cognitive architecture of such theory of mind (ToM) abilities are poorly understood. Here we disentangle possibly distinct functional mechanisms that any system performing mental state attribution has to involve. Some of these may be spontaneously triggered and present in early infancy, while others might involve an effortful deliberation process. We present a series of studies involving various methodologies where we address questions regarding when and how exactly mental state attributions are computed and identify the possible mechanisms involved. Such studies may bring us closer to understanding the underlying representational skeleton and the processes that may support the rapid encoding and revision of mental state related information.

Albert Newen:

THE DEVELOPMENT OF FALSE BELIEF UNDERSTANDING – THE PERSON MODEL THEORY AND THE ARCHITECTURE OF MENTAL FILES

Abstract: The theory of mind (ToM) ability is by far not the only social cognitive ability we have. It needs to be situated in a general framework of social understanding. The latter are systematically described in the person model theory which is an alternative to the most prominent theories of understanding others, namely Theory-Theory, Simulation Theory and Interaction Theory. Within this framework we can analyze the development of false belief understanding using the framework of mental files. A central claim is that we can analyze early implicit false belief sensitivities by presupposing unlinked regular and perspectival object files as a starting point. Then we can describe a systematic development from those unlinked object files to bi-directionally linked object files through an intermediate stage of unidirectional linking of the files. This theory can especially account for the contrast between 1. implicit and automatic gaze behavior, 2. implicit but controlled helping behavior and 3. explicit belief ascriptions.

Contributed Symposium:

CONCEPTS AND REASONING IN MATHEMATICS: NEURAL, BEHAVIORAL, AND PHILOSOPHICAL PERSPECTIVES

Marie Amalric, Carnegie Mellon University
Valeria Giardino, CNRS
Yacin Hamami, Vrije Universiteit Brussel
Véronique Izard, CNRS

Symposium Abstract: Concepts and reasoning are two essential components of mathematical thought. Both cognitive science and philosophy have attempted to understand their fundamental nature, but they have proceeded for the most part independently of each other. Some scholars, however, have tried to adopt a more interdisciplinary perspective. On the cognitive science side, scholars have found inspiration in formalisms developed in philosophy and mathematics to search for the foundations of mathematical thinking, in the domains of number (Rips et al 2008; Izard et al., 2008), or geometry (Gallistel, 1990; Izard et al. 2011), and have sought to identify the brain areas involved in high-level mathematical reasoning (Amalric & Dehaene, 2016). On the philosophical side, Giaquinto (2007) and Ferreirós (2015) have both emphasized the importance of taking into account the cognitive agent in the epistemology of mathematics, while Hamami & Mumma (2013) and Giardino (2018) have made the same point regarding the study of diagrams and cognitive tools in mathematics. The aim of this symposium is to foster this interdisciplinary perspective by bringing together two researchers in cognitive science and two researchers in philosophy to present and exchange on recent advances regarding the nature of concepts and reasoning in mathematics. Topics that will be addressed in this symposium comprise the development and roots of our intuitions of angle concepts (Izard), the cognitive bases of reasoning with diagrams in Euclidean geometry (Hamami), the role of visuospatial thinking in reasoning with advanced mathematical concepts (Amalric), and the role of space and action in the use of diagrams and cognitive artefacts in mathematics (Giardino).

Véronique Izard:
DEVELOPMENT OF ANGLE CONCEPTS

Abstract: Euclidean geometry has historically been regarded as the most 'natural' geometry. In this talk, I will present a series of experiments evaluating whether two basic concepts of Euclidean geometry, Right angle and Parallelism, may be present in humans in the absence of education in geometry. Groups of children and adults from the U.S. and from the Amazon were asked to find the 'most different picture' in panels of six figures made of two lines. Critically, the lines formed a different angle in the six figures, but each panel contained either a right angle, a pair of perpendicular lines, or a pair of parallel lines. We found that children singled out parallel lines from non-parallel lines from an early age, however, categorization of right angle emerges only in mid-childhood, and is related to learning the relevant lexicon. The right angle, a central concept of Euclidean geometry, is not initially intuitive.

Yacin Hamami:
COGNITIVE BASES OF EUCLIDEAN DIAGRAMMATIC REASONING: SOME EMPIRICAL RESULTS

Abstract: Euclidean diagrammatic reasoning refers to the diagrammatic inferential practice that originated in the geometrical proofs of Euclid's *Elements* . A seminal philosophical analysis of this practice by Manders (2008) has revealed that a systematic method of reasoning underlies the use of diagrams in Euclid's proofs, leading in turn to a logical analysis aiming to capture this method formally via proof systems (Avigad et al. 2009, Mumma 2010). The cognitive capacities involved in this form of reasoning have, however, never been investigated from the perspective of experimental psychology. In this talk, I will present joint work with Marie Amalric (CMU) and John Mumma (California State University, San Bernardino) which purports to investigate the cognitive bases of Euclidean diagrammatic reasoning, and which builds on the previous logical and philosophical analyses of this reasoning practice. I will present a general architecture for a cognitive model of Euclidean diagrammatic reasoning, together with three psychological experiments whose results support the model's empirical predictions.

Marie Amalric:
ON THE ROLE OF VISUOSPATIAL THINKING IN ADVANCED MATHEMATICAL REASONING

Abstract: Humans exhibit a unique ability for advanced mathematical thought. However, the mechanisms by which formal mathematics emerges in the human brain remain unknown. A possibility is that mathematical representations are rooted in visuospatial thinking and develop through visual experience. This hypothesis transpires in many mathematicians' introspective reports on their work. Here, I will present and discuss evidence from two fMRI experiments involving professional mathematicians (including the exceptional cases of three blind mathematicians) that support the hypothesis of visuospatial thinking and yet suggest that advanced mathematical reflection does not require visual experience to develop. First, math processing of auditory statements systematically activated bilateral intraparietal sulci and inferior temporal regions (that overlapped with the recently discovered "Visual Number Form Areas"), regardless of math domain, difficulty or visual experience. Notably, activations in these regions increased with subjects' evaluation of problem imageability. Finally, in blind mathematicians, activations even extended to the occipital cortex.

Valeria Giardino:
SPACE AND ACTION IN MATHEMATICAL REASONING

Abstract: Much of the research on human semantic and inferential competence has focused on language and its power. However, this almost exclusive focus has risked undermining the comprehension of other non-linguistic tools for thought: cognitive artefacts such as diagrams or sketches are widespread and persistent in human culture, and in particular in mathematics (Giardino, 2017, De Toffoli & Giardino, 2014). The present proposal addresses the question of the cognitive capacities and predispositions that are required in order to invent, produce, exploit, read diagrams and other spatial cognitive artefacts, by making the hypothesis that there exists something like a (human) capacity of *diagramming* (Giardino, 2016). Spatial cognitive artefacts are not simply visual tools, as the dominant view argues, but *dynamic* devices, allowing for new inferences by being *acted upon* ; they are the medium where space perception and orientation, action planning and regulation and other cognitive systems (e.g. visual and conceptual) operate in coordination in view of a cognitive task.

PROGRAM EUROPEAN CONFERENCE FOR COGNITIVE SCIENCE 2019

Contributed Symposium:

EXPLAINABLE INTELLIGENT SYSTEMS AND THE TRUSTWORTHINESS OF ARTIFICIAL EXPERTS

Tina Feldkamp, University of Saarbrücken
Eva Schmidt, University of Zurich
Andreas Sesing, University of Saarbrücken
Timo Speith, University of Saarbrücken

Symposium Abstract: We frequently rely on experts and their judgements: We consult a doctor to check whether we need additional vaccines for our trip to Asia, check the weather forecast to pack for our trip, use a navigation app to get around unknown cities, ... Some of the experts we rely on are humans. But increasingly, we rely on algorithms instead. Algorithms do trivial things such as recommending movies on Netflix or books on Amazon. But they are also used in high-stakes situations, e.g. to determine whether an applicant should receive a loan. Similarly, judges rely on algorithms to decide whether to grant parole (Corbett-Davies et al. 2017) and doctors employ algorithms to determine whether a patient should be taken off life-support (Song et al. 2018) or receive palliative care (Avati et al. 2018).

In this interdisciplinary symposium, we bring together experts from philosophy, psychology, law, and computer science to discuss both the prospects and the challenges of rely-ing on artificial experts. The first talk examines why it is morally important for artificial experts to be explainable. The second talk argues that the outputs of trustworthy artificial experts must be explainable via rationalizing explanations. The third talk relies on specific frameworks of scientific explanation to investigate the role that causal relations may play in explanations of artificial experts' judgments. Finally, the fourth talk critically discusses whether more detailed explanations (of the recommendations provided by artificial experts) guarantee increased user acceptance.

Kevin Baum, Holger Hermanns & Timo Speith:
WHY EXPLAINABLE AI MATTERS MORALLY

Abstract: We argue that opaque artificial experts threaten to violate the moral rights of those being evaluated. To avoid this, it's not enough to put a human in the loop, because even human experts should only consult artificial experts which they are epistemically justified to trust. We use the real-life example of Loomis v. Wisconsin in order to strengthen our point (cf. Moore 2017). We argue that it is morally permissible to use artificial experts if their recommendations are rationally comprehensible to human decision-makers in a way that allows them to rule out relevant alternatives and to access the reasons for the artificial expert's recommendations. Furthermore, we present our recent research in computer science as a first practical approach. It combines Abstract Dialectical Frameworks (Brewka and Gordon 2010) and practical reasoning in order to develop a well-suited data structure and so delivers the relevant kind of explanation (Baum et al. 2019).

Felix Bräuer, Eva Schmidt & Ulla Wessels:
ARTIFICIAL INTELLIGENT SYSTEMS: REASONABLE TRUST REQUIRES RATIONALIZING EXPLANATIONS

Abstract: We argue that autonomous artificial intelligent systems, including artificial experts, need to be explainable by appeal to rationalizing explanations (Baum et al. 2017): Agents ought to use such systems only if they can trust them for good reasons, but they can only do so if it's epistemically accessible to them that the systems are trustworthy, or that trust in them is appropriate. After discussing different levels of appropriate trust, we argue that the right level of trust to extend to autonomous AI systems is goal-relative trust, which requires that the trustor be able to recognize that the trustee's goal harmonizes with the trustor's goals as well as that the trustee competently pursues the goal. Users, then, need to be able to recognize the goals of such systems and the information they have to go on in pursuit of these goals – they need rationalizing explanations of the systems' behavior (Davidson 1963).

Lena Kästner, Daniel Oster & Andreas Sesing:
WHAT KIND OF EXPLANATION SHALL ARTIFICIAL EXPERTS PROVIDE?

Abstract: To ensure the trustworthiness and fairness of artificial experts, we demand that their judgments be explainable. But what does this mean? A common assumption is that explanations describe causes (e.g. Salmon 1998). While there undoubtedly is an important link between explanation and causation, recent discussions in philosophy of science also focus on underlying mechanisms (e.g., Craver 2007, Glennan 2017), difference-making (e.g. Woodward 2003), and network models (e.g. Borsboom et al. 2018). In this talk, we examine to what extent artificial experts' judgments may be explained in terms of these frameworks and what role causation plays in each case. We specifically focus on the question of how to identify causal relations among other explanatorily relevant relations. To achieve this, we combine philosophical accounts of causation with criteria commonly used in legal contexts (penal law, civil law) to constrain liability in problematic cases.

Tina Feldkamp, Cornelius König and Markus Langer:
HOW THE KIND OF EXPLANATION AFFECTS PEOPLE'S REACTIONS TO ARTIFICIAL EXPERTS

Abstract: Algorithms increasingly support decisions in ethically sensitive domains. Therefore, user acceptance of these algorithms becomes increasingly important. To ensure the acceptance (e.g. perceived fairness) of algorithm-based recommendations, it is plausible to require explanations of how relevant algorithms reach their recommendations. It remains unclear, however, which kinds of explanations best serve this purpose (cf. Langer et al, 2018). In a study concerning personnel selection, we experimentally examined the impact of different kinds of explanation on user acceptance. In a 2 (no process information vs. process information) × 2 (no process justification vs. process justification) design, participants (N = 124) received explanations and watched a video showing an algorithm-based interview. The results indicate that process justification is better than process information to improve user acceptance (i.e., higher perceived fairness). However, receiving no explanation led to results regarding user acceptance similar to receiving process justification, indicating a complex relation between acceptance and explanations.

Invited Symposium:

EVOLUTIONARY ROBOTICS AND NEURO-ROBOTICS

Dario Floreano, EPFL Lausanne
Patricia A. Vargas, University of Edinburgh

Dario Floreano:

TOWARDS HUMAN-ROBOT SYMBIOSIS - MAKING HUMANS FLY WITH WEARABLE AND AERIAL ROBOTIC TECHNOLOGIES

Abstract: Wearable technologies will lead to immersive and symbiotic teleoperation of semi-intelligent robots by means of multi-sensorial and bidirectional communication between human and robotic bodies. Recent work showed promising results in steering humanoid robots by means of human body gesture. But what does it entail to establish a symbiotic relation between a human and a non-anthropomorphic robot? In this talk I will give an overview of our recent work aimed at establishing a symbiotic relation between a human and a drone. I will describe a data-driven Body-Machine Interface and a soft exoskeleton designed to render the sensation of flight and let even inexperienced people naturally fly drones with their own bodies.

Patricia Vargas:

NEUROROBOTICS: WHAT ROBOTS CAN TEACH US?

Abstract: Neurorobotics is at the intersection of robotics and neuroscience and focus on implementing neurobiological structures underlying animal behaviour in robots. In this talk, I will show that this novel approach has the potential to replicate traditional animal experiments, reduce the number of animals used in research, and unveil neural mechanisms in a cheaper, faster design, thus facilitating the investigation of brain diseases' mechanisms and possibly informing new therapies.

PROGRAM EUROPEAN CONFERENCE FOR COGNITIVE SCIENCE 2019

Contributed Symposium:

LOSING OUR GRIP – PSYCHOPATHOLOGY AND EMBODIED PREDICTIVE PROCESSING

Jelle Bruinerberg, University of Amsterdam
Regina E. Fabry, Ruhr-University Bochum
Julian Kiverstein, University of Amsterdam
Mark Miller, University of Edinburgh

Symposium Abstract: In recent years, predictive processing (henceforth "PP") has received increased attention by cognitive scientists and philosophers who investigate the neuro-functional realisation of various mental phenomena (Friston 2010; Clark 2013). According to PP, organisms pro-actively generate models of statistical regularities of their own bodily states and the probable environmental causes of their sensory input. These models serve the function of controlling action under conditions of uncertainty. Internal models are used to predict sensory input (bodily and environmental) that arises as a consequence of the organism's practical engagement with its environment. Sensory input serves as feedback on the model and its predictions. The internal model is fundamentally geared towards maintaining the organism's adaptation to its environment.

PP offers an original proposal for the theoretical integration of phenomenological, functional, computational, and neuronal descriptions. As such, it can help us account for the radical disturbances in lived experiences associated with psychopathologies in a naturalistic framework (e.g., Fletcher & Frith 2009; Edwards et al 2012; Friston et al 2014; Badcock et al 2017). In this symposium, we will show how such theoretical integration is possible with regard to a number of psychopathologies: obsessive compulsive disorder, depression, behavioral addiction, and substance abuse. We will focus on two questions: first, how is PP able to account for these psychopathologies in terms of computational processes of Bayesian inference approximation? Second, how can PP help us understand the phenomenology of psychopathologies? In answering these questions, we will take recent empirical and theoretical research in the cognitive sciences into consideration.

Julian Kiverstein:
OBSESSIVE COMPULSIVE DISORDER: A PATHOLOGY OF SELF-CONFIDENCE

Abstract: One of the most striking changes obsessive compulsive disorder patients repeatedly describe following treatment with Deep Brain Stimulation (DBS) of the ventral striatum is an immediate and persisting increase in self-confidence. In this talk I will propose that the main

effect of striatal-DBS may actually be to increase the patient's *self-confidence*. Building on the predictive processing model of the brain, I will argue that striatal-DBS may restore the capacity for context-sensitive updating of precision expectations. This allows patients to regain responsiveness to the action possibilities the environment offers them, restoring their capacity to determine how they live their lives.

Jelle Bruineberg:
BEHAVIORAL ADDICTIONS AND ACTIVE INFERENCE

Abstract: The initial optimism about the transformative prospects of Internet and digital technology is making way for a critical debate about their impact on our mental lives and society at large. Part of the debate zooms in on the "attention crisis": the idea that the omnipresence of digital technologies limits our capability to pay attention to those things that matter to us. But how do technologies shape our attention? In this talk, I will address this question by integrating contemporary work on the neurobiology of habits and attention with views on habitual forms of intentionality. The active inference framework provides a mathematically concise account of how habits are formed and how they bias an agent's attention, perception and action.

Regina Fabry:
FEELING THE VOID - A PREDICTIVE PROCESSING ACCOUNT OF MAJOR DEPRESSIVE DISORDER

Abstract: In this talk, I will explore how personal-level descriptions of the phenomenology of major depressive disorder can be elucidated by relating them to a sub-personal-level account of precision-modulated prediction error minimisation. Major depressive disorder is characterised by clusters of phenomenal experiences that can vary within and across individuals. These experiences contribute to the existential feeling of loss – the loss of hope, a future perspective, and meaningful relations to other people. A closely related phenomenological signature of major depressive disorder is an attenuated sense of agency. From a predictive processing perspective, these phenomenal experiences are associated with diminished precision-modulated contributions of interoceptive, proprioceptive, and exteroceptive active inference to prediction error minimization. This suggests that major depressive disorder is primarily characterized by deficits in interoceptive self-awareness and the embodied interaction with the world.

PROGRAM EUROPEAN CONFERENCE FOR COGNITIVE SCIENCE 2019

Contributed Symposium:
CONDITIONS AND CONSEQUENCES OF ADOPTING INTENTIONAL STANCE TOWARD OTHER AGENTS

Jairo Perez-Osorio, Istituto Italiano di Tecnologia, Genova

Tobias Schlicht, Ruhr-University Bochum

Kai Vogeley, University of Cologne

Agnieszka Wykowska, Istituto Italiano di Tecnologia, Genova

Symposium Abstract: Humans need to predict and explain others' behaviour in order to navigate through the complexity of the social environment. These predictions, according to Daniel Dennett, are often based on the adoption of the intentional stance — that is, explaining/predicting others' behaviour with reference to their mental states, such as beliefs, desires or intentions. It is yet to be understood what are the conditions of adopting the intentional stance and consequences thereof for various mechanisms of social cognition. While this question is difficult to answer in typical cases of interaction with other humans (where intentional stance is usually a default), boundary cases might provide interesting insights. Such boundary cases can be examined from two angles:

(1) *The observed:* Interactions with, for example, non-human artificial agents, such as humanoid robots, could provide interesting insights on the conditions of adopting the intentional stance;

(2) *The observer:* Clinical cases characterised by hyper-mentalizing (schizophrenia) or hypo-mentalizing (autism) can be a valuable source of information regarding the relationship between the intentional stance and various mechanisms of social cognition.

The three speakers of the symposium would cover different disciplines — from philosophy through cognitive neuroscience and robotics to psychiatry. Thus, the discussion will span over the theoretical issues related to the concept of the intentional stance, empirical approaches and methodological challenges, as well as clinical findings. The symposium will conclude with a round-table discussion addressing the role of intentional stance for various mechanisms of social cognition, and challenges in the operationalisation of the concept.

Tobias Schlicht:

SOCIAL PREDICTIONS FROM THE PERSONAL STANCE

Abstract: Dennett's (1971, 1991) intentional stance theory suffers from an infamous tension between instrumentalism and realism about the existence of mental states attributed from the intentional stance. Given his recent flirtation with predictive processing (Clark 2016, Hohwy 2013) as a general account of mental phenomena, the question arises whether the predominantly representationalist interpretation of this theory commits Dennett to a stronger realism about beliefs, desires etc. According to predictive processing accounts, the brain harbors a hierarchical generative model of the world, other people and ourselves which issues expectations and hypotheses about the sources of sensory input. Constant comparison of actual sensory input with these hypotheses results in prediction errors, leading to model updates, while action brings about change in order to match the world with a given hypothesis. These models are often interpreted realistically in terms of structural representations (Gladziejewski 2016, Kiefer and Hohwy 2017). Social cognition, in this framework, also proceeds via person or agent models that are used to understand others (e.g. Newen 2015, Michael and de Bruin 2018). Taking the "intentional stance", on Dennett's view, amounts to being able to treat any system like a rational agent with mental states, while taking the "person stance" amounts to treating a system like an intentional system that can also take the intentional stance towards us and reciprocate social interaction and social understanding. When we regularly adopt the intentional stance towards artificial agents like humanoid robots, which stance is relevant? How do different cognitive strategies (e.g. social perception, reasoning, simulating) interact in such cases, and how can the unifying predictive processing framework capture these different strategies? Can it provide a unique alternative to these existing accounts? Does it import realist commitments?

PROGRAM EUROPEAN CONFERENCE FOR COGNITIVE SCIENCE 2019

Agnieszka Wykowska:
DO WE ADOPT INTENTIONAL STANCE TOWARDS HUMANOID ROBOTS?

Abstract: When predicting and explaining behavior of other humans, we often adopt the intentional stance, and refer to their mental states in order to understand their actions. However, it is not clear whether and when we adopt the intentional stance also towards artificial agents, such as humanoid robots. This talk will provide an overview of our research addressing this question. I will present studies in which we showed that subtle human-like characteristics of a robot's behavior (patterns of eye and head movements, gaze contingency, human-like errors) influence adoption of the intentional stance. I will then present a tool that we developed for measuring adoption of the intentional stance, and findings showing that intentional stance is coded in specific patterns of neural activity. The talk will conclude with the discussion on the role of intentional stance for various mechanisms of social cognition, and implications for applied domains of social robotics in healthcare.

Kai Vogeley:
PSYCHOPATHOLOGICAL DISTURBANCES OF MENTALIZING

Abstract: Theoretical positions in cognitive sciences have recently emphasized the person's interaction with the environment, explicated in different ways under the formula of 4E cognition (extended, embodied, enactive, embedded). Focusing on the aspect of socially embedded cognition, the dyad of two interaction partners in a social encounter is proposed as the fundamental unit of analysis. This interactive approach centered around the concept of communication is of high relevance for the understanding of psychopathological norm deviations. It is the aim of this talk to present the core ideas of this perspective and to focus on two different disturbances of mentalizing, namely hypermentalizing (delusional syndromes, schizophrenia) and hypomentalizing (autism spectrum disorder). This reconstruction of psychopathological disturbances as disorders of communication has potentially substantial influence on various research topics in psychopathology and psychiatry and can serve as show cases for the theoretical discussion of adopting the intentional stance.

ABSTRACTS
PARALLEL PAPER SESSIONS
(alphabetic order: last name of first author as keyword)

PROGRAM EUROPEAN CONFERENCE FOR COGNITIVE SCIENCE 2019

Achter:

JUDGMENTAL FORECASTING IN A COMPLEX SUPPLY CHAIN ENVIRONMENT

Sebastian Achter, Institute for Management Accounting and Simulation, Hamburg

Abstract: We conduct a qualitative field study to investigate the process of demand forecasting with focus on the role of the human planer embedded in a socio-technical environment of the organization. The goal of this single case study is to gain a deeper understanding of planner behavior in a natural setting in the context of judgmental forecasting. The main contribution to the judgmental forecasting literature by quantity comes from laboratory experiments, whereas the number of field studies generally remained on a low level over the last decades[1]. However, especially when it comes to human decision-making, experiments in carefully controlled environments capture different aspects of decision making then those found in real-world settings. Preliminary results of our field study reveal the use of normative routines as a reference. However, under certain situations the planner defects from that routine. Such deviation from the normative behavior is triggered in different situations and results in different decision steps for different planner. We identify different decision-rules and their dependency on a given context contributing to the understanding of judgmental forecasting adjustments as an organizational process.

---

[1] Arvan, M., Fahimnia, B., Reisi, M., & Siemsen, E. (2018). Integrating human judgement into quantitative forecasting methods: A review. Omega. doi:https://doi.org/10.1016/j.omega.2018.07.012

Alacam:

SYNTACTIC AND SEMANTIC DISAMBIGUATION IN A SITUATED LANGUAGE SETTING

Ozge Alacam, University of Hamburg

Tobias Staron, University of Hamburg

Wolfgang Menzel, University of Hamburg

Abstract: Human language processing successfully integrates available information acquired from different modalities. In this study, we utilize a classic visual world paradigm to investigate the role of visual modality on syntactic and semantic disambiguation of relative clause attachments. The results pointed out processing difficulties of high-attached relative clauses although the accompanying visual scene provides information in favor of correct interpretation.

Althaus:

DISSIMILAR, BUT NOT SIMILAR, LABELS PROMOTE INFANT CATEGORY LEARNING

Nadja Althaus, University of East Anglia

Abstract: Previous work has shown that labels may help infants to form object categories. In particular, co-occurrence with two distinct labels can cause infants to group objects into two subcategories, where they would normally form a single, global category. However, little is known about the role of the auditory stimuli in this context. Here we investigate whether the auditory similarity of labels (similar labels: moogle/koogle vs. dissimilar labels: moogle/kiff) affects 17-month-olds' ability to form two separate categories over two sets of objects. After a familiarisation sequence exposing infants to 8 exemplars from each category, we tested (a) whether infants recognised the features making up familiarisation items, (b) whether infants were sensitive to feature co-occurrence, i.e. recognised that there were two separate categories, and (c) whether infants encoded the word-object mapping accurately. Our results showed that only infants in the dissimilar label condition were able to categorise successfully. The test trials showed that they recognised the familiarised features and were also sensitive to switching co-occurring features, i.e. they must have learned two separate categories. Infants in the similar label condition exhibited no preference on the corresponding test trials, indicating that they had not learned successfully. In both groups infants failed to show successful word learning, although there were some infants in each group who exhibited consistent preference for a named target.

We conclude that dissimilar labels are beneficial for category formation whereas similar labels appear to be disruptive.

Andonova:

GRAMMAR & BIOLOGY IN PRESCHOOLERS

Elena Andonova, *New Bulgarian University*

Abstract: In two experiments, we examined the effects of grammatical gender on preschoolers' conceptualization of a biological property (sex) of familiar and of imaginary (unfamiliar) animals. In the first experiment, children aged between three and six years exhibited a general preference to align the sex of the animal with the grammatical gender of the referent noun. This effect increased with children's age. In the second experiment, the finding of the first study was replicated. However, when confronted with imaginary (hybrid half one animal, half another) pseudo-creatures, named by pseudo-words with a masculine vs. feminine noun ending, four year old participants' responses were not affected by a grammatical gender bias. Thus, the two studies offer support for Whorfian effects of grammar on biological concepts and extend this line of research by examining the behavior of children as young as 3 years old. Importantly, the findings help identify a constraint on such effects arising from the degree of familiarity with the referents of nouns.

Beckerle:

COGNITIVE ASPECTS OF ASSISTIVE ROBOTICS: A TECHNICAL DISCUSSION

Philipp Beckerle, TU Dortmund & TU Darmstadt

Abstract: Assistive robotic devices recently receive strong interest in fundamental as well as applied research. Beyond their potential for ageing societies, they foster understanding human cognition through technical extensions of experimental paradigms from psychology, neuroscience, and cognitive science, e.g., virtual and robotic versions of the Rubber Hand Illusion. This work analyzes three cognitive aspects, i.e., embodiment, presence, and cognitive load, that regarding their technical potential and, especially, regarding their measurability. The potential of embodiment is to serve as a metric of intuitiveness and acceptance of robot designs, controls, and interfaces as shown in first studies of semi-autonomous robot behaviors or human-robot interfaces. Physiological measures might enable continuous monitoring of device embodiment, but control adaptation using cognitive models that predict human body experience recently appears to be more realistic. Similarly, presence is an interesting metric of quality, e.g., in teleoperation, but exhibits certain overlaps with embodiment, i.e., experiencing oneself and a place illusion. Physiological measures and cognitive models of presence seem to be scarce or missing. While psychometric questionnaires are actively debated for embodiment and presence, assessing cognitive load through such could support improving the design of (semi-)autonomous controls. Hence, embodiment, presence, and cognitive load are concluded to be promising factors for engineering research and development, especially to guide technical implementation, e.g., autonomy levels or human-robot interfaces. Future assistive robotic devices might draw on advanced cognitive models of how their users experience their bodies to adapt their control and improve user experience.

Bergold:

MORAL JUDGMENT IN CHILDREN

Judith Bergold, Georg-August Universität Göttingen

Abstract: Moral judgment has become a hot topic in psychology in the last twenty years and several factors have been discovered that influence people's judgments. Among them are the locus of intervention, the directness of the action, and the order in which moral scenarios are presented. Regarding the first two factors, it was found that people that prefer (other morally relevant things equal) intervening on a threat than on a person, judged harm harsher if brought about by personal force (e.g., pushing a person from a bridge) than by non-personal force (causing a person falling from a bridge by pushing a button that opens a trap-door). Moreover, there seem to be transfer effects between moral dilemmas, i.e. people's moral judgment for an action in a certain scenario depends on which scenario has been presented directly before. These three factors were discovered in studies using only adult participants. Hence, we do not know when these factors start to play a role for moral judgments. Our aim was to start to fill this gap. To this end, we manipulated the three factors children-friendly versions of the trolley-dilemma and presented 93 five-year-old and 331 adults with them. We found that all three factors affected people's judgment. Moreover, the pattern of moral judgments of adults and children were surprisingly similar.

Bucciarelli:

EMOTIONS AFFECT DEONTIC, BUT NOT FACTUAL BELIEFS

Monica Bucciarelli, University of Torino

Philip N. Johnson-Laird, Princeton University and New York University

Abstract: Previous research has shown that the pleasantness of a moral assertion – from loathing it to loving it – correlates with how strongly individuals believe it (Bucciarelli & Johnson-Laird, 2019). Likewise, changing one of these factors has a causal effect on the other. Our present research examined two main sorts of deontic assertion, and compared each of them with corresponding factual assertions. One sort concerned morality, such as:

1) People should care for the environment
and they were matched with corresponding factual assertions, such as:

1') People care for the environment

The other sort of deontic assertions concerned social conventions, such as:

2) People should knock before entering an office

and they were matched with corresponding factual assertions:

2') People knock before entering an office

We report three experiments. Experiment 1 showed a correlation between emotions and beliefs for deontic assertions, both those referring to morals and those referring to social conventions, but no such correlation for factual assertions in which the word "should" was deleted (see the examples above). Experiment 2 showed that changing the participants' emotions about deontic conventions changed their strength of belief in them. And Experiment 3 showed the opposite causal effect: changing the participants' strength of belief in deontic conventions changed their emotions about them. This evidence corroborates mental model theory, which postulates that emotions and beliefs are maintained in parallel systems that can interact with one another (Bucciarelli, Khemlani, & Johnson-Laird, 2008).

Calzvarini:

THE CONCEPTUAL FORMAT DEBATE AND THE SUPRAMODAL BRAIN

Fabrizio Calzavarini, University of Turin

Abstract: What are concepts, and how are they represented in the human brain? For a long time, the debate on such issues has been dominated by two opposite conceptions. On the one hand, traditional theories in philosophy and cognitive science consider the conceptual system as functionally dissociated by the sensorimotor systems. According to such view, conceptual representations are amodal and arbitrary structures that bear no relationship to the physical and perceptual features of their referents, and that are stored in the multimodal or associative brain regions (=*convergence zones*) in frontal, temporal, and parietal lobes. On the other hand, advocates of the so-called Simulation Framework have argued that concepts are sensorimotor representations. According to such view, the conceptual system is distributed in brain regions that overlap or fall very close to the sensory primary and secondary regions (e.g., visual cortex, auditory cortex), and to motor cortex. In my talk, I will argue that this might be a false dichotomy. In recent years, many neuroscience data have undermined the classical distinction between sensorimotor and associative cortex, showing that multisensory convergence processes (bi- or three-modal) are already present at the level of traditionally unimodal areas. I will argue that, in order to explain such data, one has to postulate the existence of various kinds of representations with a supramodal format, i.e. a format that is intermediate between amodal and perceptual (unisensory) representations. I will consider some important implications that these observations and these data have for the debate about the format of conceptual representations.

Chakarova:

Relational Models and Cooperation in Prisoner's Dilemma Game

Desislava Chakarova, New Bulgarian University

Evgenia Hristova, New Bulgarian University

Maurice Grinberg, New Bulgarian University

Abstract: The current study aims to explore the impact of different relational models on the decision to cooperate in the Prisoner's dilemma game. These models are based on Fiske's relational models theory which posits the existence of four basic types of social relationships: communal sharing, authority ranking, equality matching, and market pricing. In the current study, these models are operationalized by both the assigned social role and the corresponding payoff distributional models: team (the players are labeled as 'team-mates' and each player receives the total payoff); hierarchy (players are labeled as 'chief' who receives 2/3 of the total amount of money of the pair and 'subordinate' who receives 1/3 of it); partners (the players are labeled as 'partners' and each player receives half of the total payoff); opponents (the players are labeled as 'opponents' and each player receives a portion of the total payoff proportional to his/hers individual payoffs); players (control condition in which the players are labeled as 'players' and each one of them receives his/hers individual payoff), respectively.

For these five conditions the cooperation rates, the mutual cooperation, the mutual defection, and the payoffs gained are analyzed for a series of forty games. The results show that the communal sharing relational model is characterized by the highest cooperation, mutual cooperation and payoffs. When the personal payoff depends on the individual points earned or when there is a social inequality, lower cooperation and mutual cooperation, higher mutual defection and, therefore, lower total payoff is observed.

Choo:

RELATEDNESS-OF-DEFINITION EFFECTS ON SEMANTIC CATEGORISATION

Magdalene S. Choo, National University of Singapore

Winston D. Goh, National University of Singapore

Abstract: Performance on unambiguous words in a semantic categorisation task (SCT) is usually better than performance on ambiguous words. Ambiguous words, however, have definitions with different levels of relatedness that may influence their processing and performance. An example of unrelated meanings is 'book' and 'unusual' for novel while an example of related senses is 'insect' and 'moving through the air' for fly. The few attempts studying relatedness-of-definition effects in SCT obtained disparate results, likely due to task demands. Thus, this experiment examined relatedness-of-definition effects and/or task demands on SCT performance. Forty National University of Singapore students performed a narrow (non-living/living) and a broad scope (abstract/concrete) SCT on words with one-meaning-one-sense (OMOS), one-meaning-many-senses (OMMS), many-meanings-few-senses (MMFS) and many-meanings-many-senses (MMMS). OMOS words (e.g. brooch) are unambiguous in that its one meaning and sense are identical. OMMS words (e.g. bargain) are polysemous words. They have one meaning but multiple related senses that reflect the meaning. MMFS words (e.g. novel) are homonyms which have many unrelated meanings but one sense per meaning. MMMS words (e.g. fly) have a variety of meanings and each meaning has many related senses. It was found that relatedness-of-definition effects were moderated by task demands. In the narrow category, accuracy on OMMS words was the highest despite similar reaction times for all word types. Longer reaction times obtained in the broad category SCT coincided with better accuracy for OMOS words compared to ambiguous words. It is proposed that processing was fluent in the narrow category and deliberative in the broad category.

Coelho Mollo:

THE TELEOCOMPUTATIONAL VIEW OF REPRESENTATION

Dr. Dimitri Coelho Mollo, Humboldt-Unversität zu Berlin, Science of Intelligence Cluster

Abstract: The most popular theories of cognitive representation currently on offer appeal to teleology in helping determine representational status and content. Compelling challenges have been moved against this strategy, suggesting that it leads to content indeterminacy, and that it conflates behavioural and representational success. In this paper, I explore an alternative role for teleology in helping account for cognitive representation.

In the Teleocomputational View (TCV) I propose, teleology comes in to help individuate computations, rather than representational status and content. A theory of representation, I argue, is to be grounded in a robust, teleologically-based theory of computation in physical systems. I show that the recently proposed mechanistic view of computation fits this job description, and leads to several advantages when taken to be at the basis of a theory of representation.

TCV sees cognitive systems primarily as consisting of relatively flexible assemblies of basic computational modules, recruited in networks able to compute more complicated functions depending on task demands. Computational states and processes acquire representational status and contents when the computational functions they compute mirror to a significant extent external entities and processes relevant for performing a cognitive task, and play a behaviour-guiding role.

I argue that TCV avoids the problems with current teleologically-based theories of content, and that it can more easily deal with related objections. Finally, I briefly compare TCV to two theories that share its basic spirit, interpretational semantics and content pragmatism, showing that it is superior to both.

PROGRAM EUROPEAN CONFERENCE FOR COGNITIVE SCIENCE 2019

Cuevas:

AGE RELATED EFFECTS ON THE NEURAL PROCESSING OF SEMANTIC COMPLEXITY IN A CONTINUOUS NARRATIVE ACCOMPANIED BY GESTURES

Paulina Cuevas, Philipps-Universität Marburg

Benjamin Straube, Philipps-Universität Marburg

Abstract: Gestures are elemental components of social communication and aid processing of semantic complex messages (Cuevas et al., 2019). However, little is known about the age-related effects concerning the perception of semantic complexity and the facilitative role of the gestures within an ecologically valid context. The goal of this study was to investigate if older compared to younger subjects process complex passages of a story differently than less complex passages and if they profit to different extents from the presentation of gesture information.

38 healthy participants (Age range 19-55) watched 16 video clips of a short narrative while instructed to carefully listen to and watch the narrator while functional magnetic resonance imaging (fMRI) data were acquired. The videos contained passages with and without various co-speech gestures, as well as passages where the semantic complexity was either low or high, as measured by the metric of idea density.

Our results replicated findings from our previous publication (Cuevas et al. 2019, "The facilitative effect of gestures on the neural processing of semantic complexity in a continuous narrative"), which associated the deactivation of DMN with increasing semantic complexity and reduction of activation in language-related areas when speech was accompanied by gestures. Nevertheless, the age of the participants seems to influence the processing of semantic complexity. Our analysis revealed reduced DMN activation and increased prefrontal compensatory processes in older subjects. Importantly, age related effects were more pronounced in segments without gestures then in segments with gestures, suggesting a compensatory role of gesture in older subjects, especially during complex passages of the story.

Dessaix:

WHAT DOES IT TAKE TO BE A PRIMITIVE CONCEPT? SEPARATING INNATENESS FROM FOUNDATIONALISM

Dominie Dessaix, Australian National University

Abstract: This paper is part of a project on primitive concepts used in linguistics and whether such primitives can play any role in a psychologically plausible theory of natural language meaning. The first part of that project is to get clear on what it would take for statements like "x is a primitive concept" to be true. The second part is to hook up the use of primitive concepts in linguists' theories of meaning with relevant psychological evidence. In this paper I focus on getting clearer on the claim there are primitive concepts of some psychological sort. I consider Carey's (2009) view, according to which we have a stock of innate "conceptual primitives", primitive mental representations that are neither sensory nor perceptual, which lay the foundation for the rest of conceptual development. I argue that looking closely at this view, especially at the notion of "innateness" (widely acknowledged to be problematic, see e.g. Mameli & Bateson 2006), reveals that there are several independent claims at work in the proposal. In particular, I argue that some representation (or any psychological entity) having *a foundational role in learning* is distinct from it being *innate*, and that these claims require partly independent kinds of evidence. Finally, I show that the former claim, essentially about developmental dependency, gets closer to what a primitive concept needs to do: play a foundational role in building a conceptual system. I argue briefly that this claim is required for some kinds of linguistic theories that posit primitive concepts.

Downey:

ENACTIVE FICTIONALISM: A BETTER ALTERNATIVE TO ELIMINATIVE MATERIALISM

Adrian Downey, Institut für Philosophie II, Ruhr-Universität Bochum

Abstract: Eliminative materialists (EM) argue a completed science of mind will require the elimination of folk psychological (FP) posits. EM faces two problems: 1) it is phenomenologically implausible; 2) it cannot explain why FP is indispensable, nor how it could be replaced. I will argue an enactive fictionalist account can preserve the empirical and metaphysical benefits of EM whilst providing a resolution of problems (1) and (2). Thus, it provides a more plausible alternative to EM.

First, I argue that enactive accounts dissolve the boundaries between traditional folk psychological categories (perception, action, affect) and do away with 'directions of fit' between mind and world (belief, desire). Enactivism thereby vindicates the eliminativist claim that our best mind science eliminates FP. Importantly, however, an enactive elimination of FP is driven by an aim to stay true to the phenomenology of our experience. As such, it is phenomenologically plausible, and so avoids problem (1).

Next, I explain that FP performs a complexity reduction role in everyday discourse. FP provides 'quick and dirty' shortcuts which cut across the reality of mindedness to create abstract, coarse-grained approximations of dynamical interactions between embodied-brains and their environments. Although strictly speaking false, such FP explanations are heuristically indispensable, and so FP can be accorded the status of a fictional posit. In this manner, I explain why FP is indispensable for human interaction and so avoid problem (2).

In this manner, I arrive at an enactive fictionalist position, which retains the positives of EM whilst side-stepping problems one and two.

Engelmann:

MORAL REASONING WITH MULTIPLE EFFECTS

Neele Engelmann, University of Göttingen

Michael R. Waldmann, University of Göttingen

Abstract: In moral dilemmas, an agent often performs an action with a positive, intended effect and a negative, unintended side effect. Much research has been focused on identifying the factors rendering such actions permissible, for example by studying trolley cases. Rather little attention has been devoted to people's moral evaluation of common-cause structures more generally. In several empirical studies, we investigate how people evaluate these situations in terms of moral justification and moral responsibility. We presented participants with cases in which an action causes a negative side effect (killing people, animals, or plants). While the side effect was held constant across conditions, we varied the number of entities that were helped as a primary effect. Moreover, we manipulated whether these entities were saved from a threat or whether the action merely led to a further improvement. We found that subjects aggregated the outcomes across multiple effects when asked about moral justification. With an identical negative side effect, the action was seen as more morally justified the more entities were helped. Also, saving has more impact on judgments of justification than mere improving. We additionally asked subjects to assess moral responsibility and found that agents were held less morally responsible for the same side effect when their action's primary effect was an instance of saving as opposed to improving. We demonstrate that people's moral justification judgments can, to a large extent, be accounted for by their subjective utilities of the action's consequences. For moral responsibility judgments, two competing explanations are discussed.

Erdmann:

EXAMINING SPONTANEOUS RECOVERY EFFECTS IN GERMAN ORTHOGRAPHY INSTRUCTION METHODS

Julia Erdmann, Ruhr-Universität Bochum

Nikol Rummel, Ruhr-Universität Bochum

Abstract: The current study set out to investigate whether recovery effects – which have been demonstrated in basic research on extinction learning – similarly occur in the context of German orthography instruction methods that encourage children to write in their own idiosyncratic way with the help of a phonetic table. These methods yield two essential problems: (1) In languages with an imperfect sound-letter correspondence, phonetic writing inevitably leads to orthographically incorrect spellings, (2) learners spelling errors are not corrected for a prolonged period of time. Thus, presumably long-term memory is being established for learners' idiosyncratic erroneous spellings. It is reasonable to assume that when children have to learn the correct spellings later, the initially established idiosyncratic spellings are not completely erased. We hypothesize that even if erroneous spellings have seemingly been extinguished, they may reappear later in students' spellings in the form of recovery effects (spontaneous recovery). We tested this hypothesis in a maximally controlled laboratory setting through the use of an artificial vocabulary. We have just completed data collection. Preliminary analyses confirm our hypotheses.

Espejo-Serna:

THE SENSE OF OWNERSHIP IN BODILY AWARENESS AS A SENSE OF SPACE

Juan C. Espejo-Serna, Universidad de la Sabana

Abstract: De Vignemont (2018) offers two purported counterexamples against the claim that the sense of ownership characteristic of bodily awareness can be accounted for in terms of the spatial structure of said awareness. The first one is the alleged possibility of having referred sensations in a tool without a sense of ownership over said tool. The second one is the case of patients suffering of somatoparaphrenia: subjects with an awareness as of pain in a bodily part of which they have no sense of ownership. In this paper, I argue against the effectiveness of these examples as an attack on the view that the sense of ownership is to be account for in spatial terms.

Fiebich:

IN DEFENSE OF PLURALIST THEORY

Dr. Anika Fiebich, University of Milan

Abstract: In this talk defend pluralist theory against various objections. First, I argue that although traditional theories may also account for various ways to achieve social understanding, they still put some emphasize on one particular epistemic strategy (e.g., theory or simulation). Pluralist theory, in contrast, rejects the 'default assumption' that there is any primary or default method in social understanding. Second, I illustrate that pluralist theory needs to be distinguished from integration theory. On the one hand, integration theory faces the difficulty of trying to combine traditional theories of social understanding that have contradictory background assumptions. On the other hand, pluralist theory goes beyond integrating traditional theories by accounting for a variety of factors that may play a role in social understanding but have been (widely) neglected in such theories, including stereotype activation, social and personal relationships, contextual features, individual moods and perceptions etc. Third, I argue that if the default assumption is rejected, pluralist theorists need to provide another positive account of why one particular (set of) cognitive process(es) is more likely to come into play in a specific instance of social understanding than others in order to provide a genuine alternative to traditional theories. I discuss three pluralist theories that meet this challenge by pointing to normativity, fluency, and interaction.

Fischer:

S<small>ALIENCE</small> B<small>IAS IN</small> P<small>OLYSEMY</small> C<small>OMPREHENSION:</small> E<small>FFECTS ON</small> J<small>UDGMENT AND</small> R<small>EASONING</small>

Eugen Fischer, University of East Anglia

Paul Engelhardt, University of East Anglia

Abstract: This talk investigates how salience imbalances between different senses of polysemous words can influence further judgment and natural language reasoning. We present evidence of a previously unrecognised cognitive bias arising from polysemy processing. The 'salience bias' arises where polysemous words have a dominant sense far more salient than all others, and the stereotype/schema associated with the dominant sense is functional for the interpretation of less salient uses. The bias leads to contextually inappropriate stereotypical inferences which competent speakers go along with, even when they know that the inferences at issue are inappropriate.

We studied inferences from the verb 'to see', whose visual sense is most salient. In a pre-study, participants assessed the propriety of spatial inferences (from 'S sees X' to 'X is in front of S', licensed by the dominant visual sense) from various less salient uses. Spatial inferences from epistemic uses ('I see your point') were deemed most inappropriate. The main study used eye-tracking and combined reading-time measurements with plausibility ratings, within a cancellation paradigm, to garner evidence that the verb's dominant sense is functional for the interpretation of epistemic uses, to document inappropriate spatial inferences from such uses, and to examine to what extent these inferences influence further judgment. Results provide evidence that less salient uses triggered inappropriate inferences that influenced further judgment, even when participants knew them to be inappropriate. We finally provide textual evidence that such inferences drive natural language reasoning, in influential philosophical arguments (classical paradoxes about perception known as 'arguments from hallucination').

Garofalo:

IS COLOR AN INTEGRAL PART OF OBJECT MOTOR REPRESENTATION?

Gioacchino Garofalo, University of Parma

Lucia Riggio, University of Parma

Abstract: Color conveys specific information about the *status* or the *quality* of an object, but whereas its role in object recognition has been widely studied, little is known about its role in sensorimotor processes. We performed two experiments in order to assess whether color contributes to motor representation of graspable objects. In Experiment 1, we use an action compatibility task, in which participants categorize each object as natural or man-made, by performing reach-to-grasp movements. Response grasps can be compatible or incompatible with the ones normally used to manipulate the objects. Results show faster reaction times (RTs) for natural objects displayed in the correct color with respect to both inverted color and correct color man-made objects. In Experiment 2, in order to directly asses the effect of color on object motor representation, we use an interference task in which an irrelevant visual object is shown during the execution of a pre-specified reach-to-grasp movement. Results highlight a reversed compatibility effect when objects are shown in the correct color, but only at the beginning of the movement. Taken together, these results reveal that color can be significant for the motor system, highlighting the close link between color and shape.

Ghiglino:

HUMAN SENSITIVITY TO SUBTLE HINTS OF HUMAN-LIKENESS IN A HUMANOID ROBOT'S BEHAVIOR

Davide Ghiglino, Instituto Italiano di Tecnologia & Unversità degli Studi di Genova

Davide De Tomasso, Instituto Italiano di Tecnologia

Agnieszka Wykowska, Instituto Italiano di Tecnologia

Abstract: Dennett's model of stances provides an interesting framework for investigating attribution of mental states and intentionality towards artificial agents. Dennett postulated the existence of different strategies that we spontaneously adopt when we interact with various types of agents. In particular, when we interact with complex artifacts, we tend to formulate our representation of their behavior relying on their design and functioning. On the contrary, we tend to explain human behavior in term of underpinning mental states, intentions, desires and beliefs – we typically adopt the intentional stance towards humans. The present study aims to test whether manipulating subtle behaviors displayed by a humanoid robot affects adoption of the intentional stance toward it. We exposed forty participants to two different behaviors of the same iCub robot. After each behavior, we asked our participants to express their impressions regarding the iCub robot with self-report questionnaires. Participants showed great heterogeneity in terms of sensitivity to the differences between the behaviors displayed by the iCub robot. Individual differences appeared to affect the participants' judgments regarding human-likeness and intentionality of the robot.

Grabenhorst:

Primate Amygdala Neurons Simulate Decision Processes of Social Partners

Fabian Grabenhorst, University of Cambridge

Raymundo Baez-Mendoza, University of Cambridge

Wilfried Genest, University of Cambridge

Gustavo Deco, Universitat Pompeu Fabra

Wolfram Schultz, University of Cambridge

Abstract: By observing their social partners, primates learn about the reward values of objects. Such values learnt from observation may not only inform own decision-making but also help understand the decisions of others. Here we show that monkeys' amygdala neurons derive object values from observation and use these values to simulate a partner monkey's decision process. While monkeys alternated making reward-based choices, amygdala neurons encoded object-specific values learned from observation. Dynamic activities converted these values to representations of the recorded monkey's own choices. Surprisingly, the same activity patterns unfolded spontaneously before partner's choices in separate neurons, as if these neurons simulated the partner's decision-making. These 'simulation neurons' encoded signatures of mutual-inhibitory decision computation, including value comparisons and value-to-choice conversions, resulting in accurate predictions of partner's choices. Population decoding identified differential contributions of amygdala subnuclei. Biophysically realistic modelling of amygdala circuits showed that simulation neurons emerge naturally from convergence between object-value neurons and self-other neurons. By simulating decision computations during observation, these neurons could allow primates to reconstruct their social partners' mental states and may constitute simple precursors for human mentalizing capacities, such as theory of mind.

Grusdt:

PROBABILISTIC MODELING OF RATIONAL COMMUNICATION WITH CONDITIONALS

Britta Grusdt, University of Osnabrück

Daniel Lassiter, Stanford University

Michael Franke, University of Osnabrück

Abstract: While much research has focused on the semantic meaning of conditionals, considerably less attention has been paid to formal models of the pragmatic use and interpretation of these constructions.

We here take a probabilistic approach to pragmatic reasoning about conditionals which flexibly integrates gradient beliefs about richly structured world states. We model listeners' update of their prior beliefs about the causal structure of the world and the joint probabilities of the consequent and antecedent based on assumptions about the speaker's utterance production protocol.

We show that model predictions vindicate a number of inferences from conditionals attested in the literature, including epistemic inferences, Conditional Perfection and Biscuit readings, when natural contextual assumptions are supplied. We argue that this approach also helps explain three puzzles introduced by Douven (2012) about updating with conditional information: depending on the utterance context, the listener's belief in the antecedent may increase, decrease or remain unchanged after uptake of a conditional.

Hohenberger:

INQUIRY AS AN INSIGHTFUL TOOL TO ENHANCE CHILDREN'S TOOL INNOVATION ABILITY

Anıl Karabulut, Middle East Technical University

Sahura Ertuğrul, Middle East Technical University

Annette Hohenberger, Osnabrück University

Abstract: Starting from an early age, children are experts at tool use, yet the literature reveals that children show low success rates in tool innovation tasks until the ages of 6-7. As opposed to tool use which is clearly defined by a set of known action rules, tool innovation requires children to come up with novel activity in order to achieve success. In a positive perspective, the obstacles children experience during tool innovation tasks might be overcome via scaffolding, especially by framing the task appropriately and, asking prompt questions to trigger insightful solutions by reformulating the current problem. In the current ongoing study, possible effects of task-related inquiry questions on performance of 5-6 year-old children (N=21; 12 boys, 9 girls) were investigated during the hook task presented with a short framing story to motivate children. Preliminary results revealed that children who received task-related inquiry questions performed better in the tool innovation task as compared to children in the control condition. Additionally, two different scoring schemas were created aiming to measure cognitive and technical aspects of their performance. Based on that, prompting children with inquiry questions improved technical aspect of their performance during the task. These findings support the idea that the bottleneck where children have difficulties in tool innovation tasks may not be in the cognitive domain, i.e. being unable to come up with a proper idea but in the technical domain, more precisely, children may struggle projecting what is in their mind onto their technical skills.

Ippedico:

TOWARDS A LINEAGE EXPLANATION OF OUR CONCEPTUAL SYSTEM

Bruno Ippedico, Australian National University

Abstract: Jackendoff's (2002) Parallel Architecture, or PA, carves up the language faculty into three independent systems: phonology, syntax, and semantics. This talk is about the evolution of the semantic, or conceptual, system, a version of the language of thought (Fodor, 1975). What I am after is a lineage explanation (Calcott, 2009) of our semantic system: a model of change that describes the steps by which the semantic system of our common ancestors with chimpanzees evolved into our own. Although Jackendoff suggests that the ancestral system was similar to that of modern-day chimpanzees, he doesn't give a precise description of it like he does for the human one, partly due to methodological challenges in describing chimps' cognitive abilities. That is not a great way to start. I will argue that recent work by Wierzbicka (2014) can clarify the nature of chimpanzees' cognitive abilities and so help describe the chimp semantic system in PA terms.

Kahl:

HOW ACTIVE INFERENCE CAN FACILITATE BELIEF COORDINATION IN MULTI-AGENT INTERACTION

Sebastian Kahl, Bielefeld University

Stefan Kopp, Bielefeld University

Abstract: We present a hierarchical Bayesian model based on principles of active inference to investigate the interplay of core processes within the social brain, during communicative interaction between multiple agents. Building on recent work on the sensorimotor processes in action and perception, the model is extended to contribute a functional account of reciprocal belief coordination on the basis of communicative intentionality. We briefly introduce the theoretical foundation and show simulation results of communicating agents.

Kirfel:

I Know What You Did Last Summer (and How Often). Epistemic States and Statistical Normality in Causal Judgements

Lara Kirfel, University College London

Professor David Lagnado, University College London

Abstract: Our ability to form causal judgements plays a fundamental role in human cognition. Fortunately, our environment is rich in statistical information. Recent research suggests that the statistical normality of a causal factor, i.e. how likely, typical or frequent it is perceived, can also make a difference to people's judgment about the causal strength of this factor (Hitchcock & Knobe, 2009; Samland & Waldman, 2016; Kominsky et al., 2015; Icard, Kominsky, Knobe, 2017). Specifically, people are more inclined to judge that C causes E, when C perceived to be statistically "abnormal", i.e. unlikely, infrequent or atypical manner, rather than statistically normal. In this paper, we argue that statistical abnormality influences causal judgements about human agents by changing the agents' epistemic states (*Epistemic Hypothesis*). In Experiment 1, we replicate previous findings that people assign more causal strength to a statistically abnormally acting agent, but show that they also assign them more knowledge about the behaviour of their peers. In Experiment 2, we show that in case of equal epistemic uncertainty, people do not differentiate between statistically abnormal and normal causal agents. In Experiment 3, we explore the difference between type and token abnormality, and find that a token abnormal, but type normal behaviour still influences causal judgments, with people's epistemic judgments mirroring these causal judgments. We discuss the implications of this research for current norm-frameworks in causal cognition.

Kohar:

DUAL EXPLANANDA: WHY A POPULAR DEFENCE OF REPRESENTATIONALISM FAILS

Matej Kohar, Ruhr-Universität Bochum

Abstract: The representational theory of mind and the representationalist paradigm in cognitive neuroscience face the objection that the contents of the representations they postulate to explain cognitive phenomena are explanatorily impotent. For every representational explanation of a cognitive phenomenon there is an equivalent one, which contains all the relevant causal factors, but omits any mention of representational content. Instead, physical or syntactic properties of the representational vehicles wholly explain the phenomenon at hand.

The dual-explananda defence is the claim that although a complete causal/mechanistic explanation of how a phenomenon is produced needn't involve appeals to representation, there are nevertheless further questions which cannot be satisfactorily answered without appeal to the representational status and contents of the vehicles. Examples of these *secondary explananda* include the fit between the mechanism and the phenomenon (fittingness-explanandum) and the success or failure of token behaviours (success explanandum).

I argue that secondary explananda can be accounted for in mechanistic explanations without involving representational contents. I utilise the mechanistic account of contrastive explanation to argue that the secondary explananda are underspecified in their original formulation. Once they are fully specified, it turns out that fittingness-explananda can be accounted for by situating the mechanism in context of the other mechanisms operating in the cognitive system. Success-explananda can be accounted for by careful analysis of failure types. In this, the mechanistic approach is better than the representational one, because success and failure types do not map neatly onto cases of correct and incorrect representation.

PROGRAM EUROPEAN CONFERENCE FOR COGNITIVE SCIENCE 2019

Košová:
TRUE SELF BEHIND THE FACE OF THE FUTURE

Mgr. Michaela Košová, Charles University, Prague

Robin Kopecky, Charles University, Prague

Abstract: Recent debates about the problem of human enhancement eventually have to address the question of personal identity. The aim of this paper is to draw attention to a different aspect of personal identity that arises with the experimental approach towards philosophy. Various studies point to the fact that the folk concept of personal identity is socially determined and that the preservation of the true self depends on the positive moral traits that figure strongly in interpersonal relationships. What is more, the concept of the "essential moral self" that stands behind these findings shares certain crucial characteristics with the folk concept of the soul. Our aim here is to use our own research to support the previous findings and further demonstrate how people see the "true self" of a person. We will briefly mention our interview study with over 200 children about personal identity, which supports the "essential moral self" hypothesis. Then we will introduce our online questionnaire study on dualistic intuitions with nearly 3000 adult respondents, which supports the hypothesis that the "essential moral self" bears connection to the folk concept of the soul. This gives us a certain clue as to how to approach the question of human enhancement and transhumanism. If what we ultimately care about is the moral core of the person (a "soul") which is capable of interpersonal connections, this is what we should strive to save and protect in the process of gradual transformation of the human nature.

Krickel:

ARE THERE UNCONSCIOUS MENTAL PHENOMENA? – FIVE CHALLENGES FOR THE EMPIRICAL INVESTIGATION OF THE UNCONSCIOUS MIND

Beate Krickel, Ruhr-Universität Bochum

Abstract: The claim that there are unconscious mental phenomena (UMP) is ubiquitous in various areas of philosophy and cognitive science. It is argued that perception can happen unconsciously, that our actions are influenced by unconscious attitudes, and that even decision-making can occur unconsciously. However, a closer look at the empirical evidence for UMP suggests a less clear picture. There are at least five challenges: First, the empirical criteria for non-consciousness of the relevant mental states or processes do not conclusively show that the mental states at question are really unconscious. Second, it is unclear in which sense the unconscious states are supposed to be mental and how this is empirically substantiated. Third, on the assumption that the justification for UMP is an inference to the best explanation, it is unclear why explanations referring to UMP should indeed provide the *best* explanation. Fourth, explanations referring to UMP can (at least) be *rationalizing explanations* or *mechanistic explanations*. Failing to appreciate this distinction, researchers misleadingly take subjective reports about absence of reasons to provide evidence about absence of conscious causes. Fifth, it is doubtable whether the postulation of unconscious mental states indeed has any explanatory value. There are many different contrasts to 'conscious' (such as 'pre-conscious', 'a-unconscious', 'p-unconscious', 'non-conscious', 'procedural', 'non-declarative', 'automatic', 'subliminal', 'denied', 'miscategorized', 'fragmented', 'not reportable', 'implicit', 'not integrated' – to mention just a few) and 'mental' (such as 'neural', 'non-representational', 'not conscious', 'sub-personal'). An explanation referring to unconscious mental states is empty without a specification of what is meant by 'unconscious' and 'mental'.

I will present these challenges in detail and show how meeting them requires a profound theoretical analysis of the concepts, arguments, and explanatory goals underlying the empirical research of putative unconscious mental phenomena. Furthermore, I will show how a pluralist account of the unconscious mind provides the best starting point for fruitful empirical research.

Kulikov:

A MATHEMATICAL APPROACH TO ENACTIVISM

PhD Vadim Kulikov, Aalto University

Abstract: In the last decades cognitive sciences have been experiencing a shift in how cognitive processes are viewed. A major theme in cognitive science today is embodiment, enactivism, extended, ecological and embedded cognition. One of the main objectives of this approach is to break out from certain traditional ways of thinking about the mind. For example, enactivists oppose the view that all cognitive processes can be well modelled by a logical symbol manipulation or information processing framework. According to enactivists, semantics, ideas, memories and other cognitive achievements are not represented, but enacted. This has been subject of quite a bit of controversy.

Classical cognitive science with its "computer metaphor'' has the whole mathematical machinery of first-order logic and computer science at its core. The connection is quite straightforward. The Tarski definition of truth gives a way of connecting logical sentences with a model. Thus the main ingredients are logical symbols and deduction. They can be also replaced by representation and information processing, but essentially that leads to the same paradigmatic approach.

In this essay I will attempt to sketch a research project towards a new mathematical model of cognition which is based on enactivist premises. Because of limitations in length, I will only give a brief mathematical definition and a simple example relating to a simple organism. However, the hope is that this mathematical approach carries with it a big potential.

Lancellotta:

ARE CLINICAL DELUSIONS ADAPTIVE? THE CASE OF OCD

Eugenia Lancellotta, University of Birmingham

Abstract: Delusions are fixed irrational beliefs which are not amenable to change in the face of counter-evidence. They are present in various psychiatric illnesses, from schizophrenia, to delusional disorders and OCD. Delusions are usually held to be a harmful and dysfunctional phenomenon, a breakdown of some component of the mind/brain. It would then seem counterintuitive to propose that such bizarre and dysfunctional beliefs could also present benefits. However, it has been suggested that some delusions can be psychologically adaptive when some kind of impairment is present. A mechanism is biologically adaptive when it allows an organism to survive and reproduce in a given environment by fulfilling the evolutionary function it was designed for. By analogy with biological adaptiveness, a mechanism or a mental state is considered as psychologically adaptive when it promotes the wellbeing and good psychological functioning of an individual. Delusions are usually held to be adaptive in the sense that they are a response to a breakdown which is already present and about to threaten the foundations of a subject's epistemic and emotional engagement with reality. In the present paper, I am going to support the view that certain delusions can be psychologically adaptive. In particular, I put forward the novel hypothesis that delusions in OCD can deliver important psychological benefits, such as supporting rational agency and intrapsychic coherence, in the face of obsessive-compulsive symptoms.

Löhr:

S<small>IMULATIONS,</small> <small>ABSTRACT CONCEPTS AND COPREDICATION</small>

Guido Robin Löhr, Ruhr-Universität Bochum

Abstract: According to the embodied cognition hypothesis, the mental symbols used for higher cognitive reasoning, such as the making of deductive and inductive inferences, both originate and reside in our sensory-motor-introspective and emotional systems. The main objection to this view is that it cannot explain concepts that are, by definition, detached from perception and action, i.e., abstract concepts such as TRUTH or DEMOCRACY. This objection is usually merely taken for granted and has yet to be spelled out in detail. In this paper, I distinguish three different versions of this objection (one semantic and two epistemic versions). Once these distinctions are in place, we can begin to see the solutions offered in the literature in a new, more positive, light.

Lohmann:

GRASPING UNCERTAINTY: A FREE ENERGY APPROACH TO ANTICIPATORY BEHAVIOR CONTROL

Johannes Lohmann, University of Tübingen

Patrick Weigert, University of Tübingen

Martin V. Butz, University of Tübingen

Abstract: According to theories of anticipatory behavior control, actions are initiated by predicting their sensory consequences. Predictive processes are assumed to activate currently desired goal states, as well as the expected sensorimotor mappings necessary to realize them, dependent on the involved predicted uncertainties before actual motor control unfolds. Evidence for such an anticipatory tuning of sensorimotor mappings has been found in visual processing, but also for spatial body representations, especially peripersonal space (PPS). Data from experiments using the crossmodal congruency indicate that PPS is mapped to the future hand location in grasping movements. In these experiments, participants performed a prehension movement. Before or during the movement, they received a tactile stimulation of a finger, at the same time a visual distractor appeared at the future finger location at the target object. PPS is characterized by multisensory processing, yielding interference between visual and tactile stimuli. This interference was observed at the target location, especially in case of stimulation, at or after movement onset. The respective results are in line with theories of anticipatory behavior control. Our aim here was to provide a formal account for the observed results with a free-energy based model that is able to account for the core findings qualitatively. The model could indeed reproduce modulations in multisensory processing, as well as the time-course of these modulations. In future studies, we intend to further probe behavioral predictions generated by the model.

Mallot:

LANGUAGE CUES IN THE FORMATION OF HIERARCHICAL REPRESENTATIONS OF SPACE

Hanspeter A. Mallot, Institute for Neurobiology, University of Tübingen

Wiebke Schick, Institute for Geoinformatics, University of Münster

Abstract: We study the role of verbal cues (place and region names) in the formation of hierarchical, or regionalized, representations of large scale space. Spatial representations were probed behaviorally, i.e. by route choices between two equidistant, alternative routes differing only in the number of regions they touched. Wiener and Mallot (*Spatial Cognition and Computation*, 2003) showed that visual objects taken from one semantic category and placed in spatial vicinity induce region representations in the sense that routes reaching the goal region earlier are preferred over equidistant routes entering the region of the goal only later. Here we show that region dependent route preference is no longer found if the landmark objects are replaced by sign posts displaying written object names. Naming schemes with explicit region naming or contextual relation of place names were also tested and led to significant effects on region dependent route choice in some conditions but not in others. A comparison with word association (pointwise mutual information in deWaC corpus) did only partially explain the differences. We conclude that language cues differ from visual landmark objects in the formation of spatial representations. Region effects based on language cues are found if the place cues imply spatial nearness or allow for common narratives, but not if they are only related by semantic category.

Martinez:

ECOLOGICAL INFORMATION IS NOT SUFFICIENT FOR DIRECT PERCEPTION

Manolo Martinez, Universitat de Barcelona

Abstract: In ecological psychology, *ecological information* is information about affordances, carried by patterns in ambient energy. Ecological psychologists claim that agents directly perceive affordances by picking out this ecological information, without their brains needing to represent, or compute, anything.

I present a simple model in which, while energy carries ecological information about an affordance, the direct perception of this affordance is not possible. The model exploits the fact that two different sensory surfaces of an agent are sensitive to two different aspects of the energy array (say, ambient light and sound waves), and the presence or absence of the affordance is necessitated by information contained synergistically in both such aspects. In such a situation, typical of so-called *cross-modal perception*, under very minimal assumptions about brain architecture, exploitation of ecological information won't be possible without computation, if at all.

Martinez-Manrique:

THE PROBLEM OF SELF-DECEPTION ACKNOWLEDGMENT

Fernando Martinez-Manrique, University of Granada

Abstract: I address the challenge of understanding how a person can explicitly acknowledge that she was self-deceived. First, I characterize the notion of self-deception acknowledgment, arguing that it has four main distinctive features: 1) Effortfulness. 2) Relapse. 3) Reconstructive nature. 4) Two-layered assessment. Second, taking those main features as part of the explananda for a theory of self-deception, I evaluate the prospects for intentional and non-intentional accounts. I argue that (4) seems to favour intentionalists, given that admitting self-deception seems to involve recognition by the subject of a certain intention that kept a "rightful" belief at bay. However, non-intentionalists can rely on (3) to reply that admissions of self-deception might be not different from rational reconstructions. I assess the problems of this construal in explaining the instrumental role that self-deception acknowledgment plays in changing certain behaviours. Third, I focus on three specific accounts of self-deception based on different psychological mechanisms: a consequence of a massively modular mental architecture; an adaptation to improve interpersonal deception; a pretend belief. I argue that neither of them has the appropriate resources to deal with acknowledgments of self-deception. Finally, I sketch an account that tries to do justice to (1)-(4). The point is to see how acknowledgments of self-deception can be reconstructions of something real. Self-deception will appear as a process and acknowledging self-deception as a way of uncovering this process and the causally relevant mental states that it involves.

Morin:

Reverse Engineering Cash: Coin Designs Mark out High Value Differentials and Coin Sizes Track Values Logarithmically

Morin, Olivier, Minds & Traditions Research Group, Max-Planck-Institut für Menschenrechte, Jena

Barbara, Pavlek, Minds & Traditions Research Group, Max-Planck-Institut für Menschenrechte, Jena

James Winters, Minds & Traditions Research Group, Max-Planck-Institut für Menschenrechte, Jena

Abstract: We know from cognitive science and behavioural economics that the perception of the value and physical properties of cash money is subject to various biases. This study focuses on the converse phenomenon: how the design of coins may reflect cognitive biases and ergonomic needs. We show that coinage across the world's currencies is more likely to use distinctive designs for pairs of coins with high value differentials. Coin sizes reflect monetary values, albeit in a non-linear fashion. Log-transformed values predict coin sizes and design distinctiveness better than raw values, suggesting that coin designs and sizes reflect monetary values on a logarithmic scale. Coin designers are intuitive psychologists, making imperfect but clear use of sound cognitive and ergonomic principles.

PROGRAM EUROPEAN CONFERENCE FOR COGNITIVE SCIENCE 2019

Niemeck:

THE SUBJECTIVE CHARACTER OF EXPERIENCE AND IMPURE INTENTIONALISM

Maik Niemeck, Albert-Ludwigs-Universität Freiburg

Abstract: Most current research on consciousness suggests that the phenomenal character of experience is composed of two different parts, its qualitative character and its subjective character (Kriegel 2009). Even though most researchers believe that this subjective character is an essential part of conscious life, so far it remains quite unclear how one is supposed to understand its metaphysical nature. An underappreciated but recently revived answer to this question conceptualizes the subjective character as part of the *modality* of experience and as a *manner* in which experience occurs rather than as a constituent of its representational content. (Pereira 2018; Thomasson 2000; Smith 1986, 2016; Recanati 2007, 2013; Musholt 2015) I will call this approach the *Self-Mode Account of Subjective Character*. Although this self-mode account is very promising it still lacks clarity and a more detailed exposition of its underlying presumptions. The aim of the proposed talk is to offer a more elaborated version of this particular approach. In order to do so, I will argue that the self-mode account itself presupposes a particular form of representationalism, which has been called "impure representationalism" (Chalmers 2004; Crane 2007, 2013) or "intermodal intentionalism" (Speaks 2015). By investigating the metaphysics of sensory, cognitive and affective states, I will argue that there are good reasons to accept impure intentionalism and explain that if we accept impure intentionalism we can for the same reasons expand the number of objects that can be part of the modality.

Ochs:

THE COMMON COMPETENCE CHARACTERIZATION OF THE EXPRESSIVE-EPISTEMIC RELATION IN MATURE NEUROTYPICAL HUMANS

Jordan Ochs, University of Connecticut

Abstract: Many creatures have psychological states. And, many of these creatures express those states with barks, growls, tail wags, etc. However, as far as we know it is only mature, neurotypical humans that can also know they are in the psychological states they express. Here, I argue that in humans there is a special relationship between the abilities to self-express and to know one's occurrent psychological state; they are two aspects of a single competence. According to this Dual-Aspect Competence Theory of self-knowledge, once humans have mastered the use of first-personal self-ascriptive linguistic tokens as vehicles to express their psychological states and the practice of assertion, they have self-knowledge any time they engage in an act of self-expression. This is due to the fact that the ontogeny of the expressive competence in a linguistic community with the practice of assertion includes the cultivation of an epistemic aspect. The fact that mature, neurotypical humans develop their expressive capacity under these conditions (and other non-human animals do not) can explain why, despite being able to express their psychological states, most creatures do not also know that they are in the states expressed.

Otto:

THE ASSOCIATIVE PROPERTY HOLDS FOR COMBINATION OF AUDITORY, VISUAL, AND TACTILE SIGNALS IN MULTISENSORY DECISIONS

Thomas U. Otto, University of St. Andrews

Abstract: A prominent finding in multisensory research is that reaction times (RTs) are faster to bimodal signals compared to the unimodal components, which is the redundant signals effect (RSE). An intriguing explanation of the effect comes with race models, which assume that responses to bimodal signals are triggered by the faster of two parallel perceptual decision units. This basic model architecture results in statistical facilitation and the RSE can be predicted based on the RT distributions with unimodal signals and probability summation. To test the explanatory power of the framework, an expansion of the bimodal RSE is that RTs to trimodal signals are even faster. To measure the effect, I presented three unimodal signals (in vision, audition, and touch), all bimodal combinations, and a trimodal condition. To adapt the model, a corresponding extension simply assumes that responses are triggered by the fastest of three parallel decision units. Following the associative property in mathematics, an interesting proposition is that probability summation with any bimodal and missing unimodal RT distribution should equally predict the trimodal RT distribution. Furthermore, the expected RSE can in fact be computed for any combination of uni- and bimodal conditions, which results in a total of seven parameter-free predictions. Remarkably, the empirical effects follow these predictions overall very well. Race models are consequently a strong and consistent candidate framework to explain the RSE and provide a powerful tool to investigate and understand perceptual decisions with multisensory signals.

Pantsar:

A Fresh Look at Research Strategies in Computational Cognitive Science: The Case of Enculturated Mathematical Problem Solving

Markus Pantsar, University of Helsinki

Regina E. Fabry, Ruhr-Universität Bochum

Abstract: Marr's seminal distinction between computational, algorithmic, and implementational levels of analysis has inspired research in cognitive science for more than 30 years. According to a widely-used paradigm, the modelling of cognitive processes should mainly operate on the computational level and be targeted at the idealised competence, rather than the actual performance of cognisers in a specific domain. In this paper, we explore how this paradigm can be adopted and revised to understand mathematical problem solving. The computational-level approach applies methods from computational complexity theory and focuses on optimal strategies for completing cognitive tasks. However, human cognitive capacities in mathematical problem solving are essentially characterised by processes that are computationally sub-optimal, because they initially add to the computational complexity of the solutions. Yet, these solutions can be optimal for human cognisers given the acquisition and enactment of mathematical practices. Here we present diagrams and the spatial manipulation of symbols as two examples of problem solving strategies that can be computationally sub-optimal but humanly optimal. These aspects need to be taken into account when analysing competence in mathematical problem solving. Empirically informed considerations on enculturation can help identify, explore, and model the cognitive processes involved in problem solving tasks. The enculturation account of mathematical problem solving strongly suggests that computational-level analyses need to be complemented by considerations on the algorithmic and implementational levels. The emerging research strategy can help develop algorithms that model what we call enculturated cognitive optimality in an empirically plausible and ecologically valid way.

Raftopoulos:

HOW DO COGNITION AND PERCEPTION INTERACT?

Athanassios Raftopoulos, University of Cyprus, Nicosia

Demetris Portides, University of Cyprus, Nicosia

Abstract: It is assumed that cognitive states affect directly perceptual processing, since perception uses conceptual contents in its processes. If someone holds that perceptual and cognitive states are cast in different representational contents, iconic and symbolic respectively, and they think that cognition affects perception, an account on this interaction should be provided. I sketch here an account of how cognitive states modify perceptual contents, addressing an objection against this possibility raised by Burnston (2017).

Burnston argues that cognitive states are symbolically structured, while perceptual states are analogical. Owing to their different representational format, cognitive states cannot affect directly perception. The reason is that cognitive representations consist of parts that do not specify some property of their referent. Perceptual representations, in contrast, have a representationally relevant internal structure since they have parts that carry distinct information about the various properties of their referents.

I examine the way perceptual and cognitive representations are stored in early perceptual circuits and working memory and argue that both are stored by means of basis function which are dense in perception but sparse in cognition. Owing to this fact, both perceptual and cognitive representations place a feature at a certain location in the feature-dimension space but in different ways. This opens up the possibility of cognition affecting directly perception. Based on this consideration, I describe a mechanism that explains the cognition/ perception interaction in the case of colors, based on the neuronal connections between the various brain areas that participate in the processing of color information.

Rosas:

TRAPPING VS. TRUSTING: JOINT ATTENTION AND COMMON KNOWLEDGE IN APES AND HUMAN INFANTS

Dr. Alejandro Rosas, Universidad Nacional de Colombia

Abstract: I argue for the paradoxical claim that apes have the capacity for joint attention, but lack the capacity for shared intentionality. This sounds paradoxical, because common knowledge seems to be at the core of both capacities. The paradox disappears if shared intentionality requires an extra component over and above common knowledge: a non-cognitive capacity to open your mind to others in trust.

The argument happens in four steps.

1. Joint attention already includes common knowledge, in the sense of instantiating a state of common knowledge, not in the sense of showing the possession of a concept of common knowledge. Possession of the concept is not required.

2. Joint attention can be spotted in apes in situations where apes compete for food: where a subordinate has privileged knowledge of a cache and is *trapped unwillingly* into joint attention to the cache with a dominant while trying to retrieve it; or where a subordinate *traps* a unwitting dominant into joint attention with a low-value cache.

3. Though human infants and adult apes both succeed in non-verbal false belief tests, but only human infants eagerly seek to establish communicative bonds with caregivers.

4. Shared intentionality requires forms of joint attention that go beyond isolated episodes of trapping or being trapped. It requires enduring instances of joint attention that cannot happen without actively trusting others. The capacity absent in apes is non-cognitive: a probably innate attitude of soliciting and offering a public sphere of openness, communication and trust.

Rudnicki:

HOW DO HUMAN BRAINS PROCESS THE LIAR PARADOX? A NEUROIMAGING STUDY AS A TEST FOR THE VIRTUAL ENTAILMENT PRINCIPLE

Konrad Rudnicki, N/A

Piotr Łukowski, N/A

Abstract: This article presents an empirical examination of the consequences of the *virtual entailment principle* proposed by Jean Buridan to resolve the Liar paradox. This principle states that every sentence in natural language implicitly asserts its own truth. Adopting this principle means that the Liar sentence is not paradoxical but false, because its content is contradictory to what is virtually implied. As a result, humans should perceive the Liar sentence the same way as any other false sentence. This solution to the Liar paradox received criticism for making *ad hoc* claims about the natural language. However, thanks to modern advancements in psychophysiology, it became possible to empirically investigate if the human brain really perceives the Liar sentence like a false sentence. We designed and conducted an experiment to examine brain activity in response to true sentences, false sentences and self-referential sentences (including the Liar and the Truthteller). Our results provide support for the Buridan's hypothesis and show that the Liar sentence is processed by the human brain identically to false sentences, while the Truthteller sentence is perceived identically to true sentences. This agrees with predictions derived from the *virtual entailment principle* and supports the idea that humans think with the logic of truth — a logic for which the truth is a designated value of its adequate semantics.

Scott:

AGENCY AND TEMPORAL SHIFT DISRUPTED BY STARTLE

Dr. Mark Scott, Qatar University

Chenhao Chiu, National Taiwan University

Abstract: Forward models are a component of the motor system that predicts the sensory consequences of our actions. These models play several key roles in motor control and are hypothesized to underlie (among other things) the two phenomena under investigation in this experiment: The feeling of agency that we have over our self-initiated actions (unlike reflexes), and the "time-shrinkage" effect, in which self-caused sensations are judged to have occurred earlier in time than sensations that are caused by an external source. This experiment probes the connection between forward models and both of these phenomena by using the "Startle" paradigm. In the Startle methodology, a startlingly loud sound causes people to initiate a prepared action at a very short latency. It is hypothesized that the latency of a startle-initiated action is so short that normal cortical operations (including forward models) are circumvented. This experiment replicates the "time-shrinkage" effect and simultaneously measures participants' sense of agency over their actions. Data collection is ongoing, but the current trend in the data is that the both the time-shrinkage effect and the sense of agency we have over our own actions is disrupted under the startle paradigm in line with the theory that these phenomena both rely on forward models.

Solfo:

AGENCY, ACTION AND JOINT ACTION

Alessandro Solfo, KU Leuven

Cees van Leeuwen, KU Leuven, TU Kaiserslautern

Abstract: The phrase "sense of agency" designates two distinct but related manifestations of experience. The first, denominated as "bodily agency", refers to the sense of being engaged in movements and is confined within or, better yet, defines the boundaries of the body. The second, which we propose to name "extended agency", emerges when agency exceeds its bodily boundaries to become a sense of controlling, through movements, events temporally concomitant with those movements. The development of bodily agency is a long-term process, beginning in the very early stages of human ontogeny since the first encounters with rhythmic coordination in intrauterine life, and continuing after birth with turn-taking coordination in neonatal feeding. By contrast, extended agency occurs when bodily agency is fully developed and requires a time interval of the order of seconds to arise. A manifestation of extended agency is epitomized by Spizzo's effect, which emerges when human agents coordinate their finger movements to the visual pulses of an isochronous metronome. As soon as the movements are perceived to be synchronized, agents sense controlling the pulses despite knowing that the metronome operates autonomously. To test rigorously this effect, we designed two experiments involving finger tapping. Findings reveal that the effect is rooted in sensorimotor coordination. Despite differences in time scale, we therefore propose that bodily and extended agency have a common source, namely, patterns of sensorimotor coordination and, accordingly, coordination constitutes the fundamental interaction of human beings.

Spychalska:

ORDER AND RELEVANCE: REVISING TEMPORAL STRUCTURES

Maria Spychalska, University of Cologne

Abstract: The paper presents ERP experiments investigating the effect of the violation of temporal order in conjunctive sentences in contexts where the order is made contextually relevant or irrelevant. The experimental paradigm resembles a memory game, in which participants assign points to a virtual player and read sentences describing the game events. There are two categories of cards: animal and non-animal cards. In each trial, the player flips two out of four cards. Afterwards, the participant assigns points based on the cards' categories and the order in which they were flipped (Experiment 1), or only based on the cards' categories (Experiment 2). Subsequently, a sentence is presented word-by-word describing the game trial, e.g. Julia has flipped a cat and a flower. In the Correct Order condition, sentences describe the events in the order in which they happened; in the Reversed Order condition, the events are described in the reversed order. Reversed Order conditions show a late positivity (P600) effect relative to Correct Order conditions at the first noun at which the order violation can be detected. This effect occurs independent of the contextual relevance of the order, i.e. it is observed both in Experiment 1, where the order of the cards was relevant for the game win, as well as in Experiment 2, where the order or the cards was irrelevant. In addition to the P600 effect, in Experiment 1, we observe a modulation of the N400 by Order: Reversed Order conditions elicit more negative N400 ERPs that Correct Order conditions.

Stephan:

EMOTIONS BEYOND THE BRAIN: VARIETIES OF SCAFFOLDED AFFECTIVITY

Prof. Dr. Archim Stephan, Osnabrück University

Prof. Dr. Sven Walter, Osnabrück University

Abstract: The recent debate about 'situated affectivity' seems somewhat odd in that it either appears to reinvent the wheel or else indulge in metaphysical intricacies such as the coupling-constitution debate that will hardly resonate with those familiar with the topic. Putting these seemingly odd excesses into perspective is the goal of the first section. There it is briefly shown why it seemed promising to carry over some of the key terms from debates in the philosophy of cognitive science to the affective domain. Furthermore, we sketch the roots of these terms in their original context and argue that taking them either *not seriously enough* blocks the view for what is really at issue. Leaving the coupling-constitution debate with its futile quarrels about whether affectivity is properly extended or merely embedded behind, and also taking it for granted that affectivity is embodied, we take a fresh look at human affectivity beyond the brain. We will elaborate on two different, albeit interconnected, ways in which our affective life is essentially a matter of our (more or less intimate) coupling with our (natural, technological, and social) environment. In the second section, we focus on interactions which originate with the individual and from there *stretch out* into the environment through a (mostly intentional) process of *resource usage*. In the third and final section, we then focus on influences which originate with structures in the environment and from there *reach inwards* into the individual through a process of (intentional or unintentional) *mind invasion*.

PROGRAM EUROPEAN CONFERENCE FOR COGNITIVE SCIENCE 2019

SUFFEL:

THE NEURAL PROCESSING OF GESTURE AND BODY ORIENTATION IN PATIENTS WITH MAJOR DEPRESSION

Anne Marie Suffel, Philipps-Universität Marburg

Prof. Dr. Benjamin Straube, Philipps-Universität Marburg

Abstract: The feeling of being addressed is the first step in a complex social-emotional processing stream enabling successful social communication. Social impairments are a relevant characteristic of patients with major depressive disorder (MDD). Here we investigated one underlying neural mechanism which might contribute to social isolation in MDD, which comprises the interpretation of socials cue such as body orientation and gesture as a first step of getting involved.

Thirty-three patients with MDD and forty-two healthy subjects took part in our fMRI study about the processing of social communicative cues. We used video clips, one version with iconic gesture accompanying speech and one without, filmed simultaneously from two different viewpoints, so that there was one version with the actor facing directly the viewer and one version looking beside the viewer. After every clip the participants were instructed to evaluate whether they have felt addressed or not.

Despite comparable behavioral performance and large overlap in activation patterns in MDD and healthy subjects, the fusiform gyrus for the gesture condition and anterior cingulate cortex (ACC) for the frontal body orientation condition appeared more activated in patients than in controls. Interaction analyses revealed that patients showed specifically higher activation that healthy subjects for the facing condition without gestures in the prefrontal cortex, the insula and hippocampus.

Hence, we conclude that MDD patients are well capable of recognizing and interpreting social cues as gesture or body orientation though they need more neural capacity to achieve the same result.

SZUBART: WHO IS IT IN THE WINDOW? DRT AND *DE SE* ATTITUDES

Tomasz Szubart, Jagiellonian University

Anna Bródy, University of Tübingen

Abstract: Imagine that David is standing in front of a mall during Christmas period and observing how Santa Claus is giving presents to the children. At some point he shouts

(1) His beard is on fire!

being convinced that Santa's beard just set on fire. Only after some time, he noticed it was his own reflection in the window, realising that actually

(2) His beard is on fire.

The problem of how to grasp (and formalise) the difference of meaning between (1) and (2) is one of the main issues in the approaches to the philosophy of mind, language and linguistics concerned with propositional attitude reports.

In this interdisciplinary paper, we are aiming to clarify the above philosophical-linguistic debate, and, exploiting Kamp's DRT extension, MSDRS, support the view that *de se* is not (1) irreducible and (2) its functioning can be well explained in a more general framework, without creating unnecessary special categories. In other words, we are suggesting that David's change of heart can be explained by the difference in linkings of anchors in a dynamic system of MSDRSs.

In effect, we are arguing that some philosophical views based on the assumption of the exceptionality of *de se* are not well founded.

PROGRAM EUROPEAN CONFERENCE FOR COGNITIVE SCIENCE 2019

VON HEISELER: INDEXICAL SIGNALING IN THE EVOLUTION OF LANGUAGE: AN EMBODIED APPROACH TO THE EMERGENCE OF SYNTAX

Till Nikolaus von Heiseler, Freie Universität Berlin

Abstract: In principal two apparently incommensurable approaches have dominated the debate about language evolution for the past few decades. (1) The traditional *generative grammar* approach conceptualized language as a productive system, in which a finite number of elements can generate a theoretically infinite number of sentences. (2) And more recently, theories of *embodied cognition* claim that higher cognitive functions—including language—are rooted in lower cognitive functions—such as the sensory-motor system. Both theories have their shortcomings in regard to evolution: generative linguistics has resisted explanation in terms of evolution, mainly because it conceptualized language as an internal symbolic machine that either works or does not (the problem of *irreducible complexity*). The embodied cognition approach, on the other hand, succeeded in designating some necessary requirements of mature linguistic communication (such as having metacognitive abilities or a *theory of mind*—the ability to attribute mental states such as beliefs, intents, and desires to other individuals or to oneself), episodic memory and the *cooperative principle)*; however, it has not yet explained the emergence of syntax in terms of evolution. In this talk I show how the embodied approach can address the problem of the emergence of syntax by including natural (indexical) signals in the communication, and how, in a second step, the display of an object with indexical meaning could spur the development of syntax-like conceptual structures in which primitive thematic roles (such as agent and patient) are marked by the direction of a mimetic gesture signifying the verb.

Wagner:

MAKING SENSE OF RIGHT AND WRONG: ENACTIVISM AND EXPERIENCES OF NORMATIVITY

Sven Walter, Osnabrück University

Jennifer Wagner, Osnabrück University

Lasse T. Bergmann, Osnabrück University

Abstract: According to *autopoietic enactivism*, cognition is not to be understood as a computational process over internal representations of an objective external world. Rather, it is a process of *meaning-generation* whereby autopoietic, i.e., self-generating, systems 'enact' their specific 'Umwelt' through their reciprocal interaction with the world. Given their need for self-maintenance, such systems develop a 'concerned perspective' on the world, making sense of it in terms of what is good or bad, better or worse, for their self-perpetuation. Yet, not any kind of meaning-generation seems to aim solely at self-perpetuation. A concerned perspective on the world is also characteristic of situations in which we experience (i) the pull of social norms, (ii) the demands posed by personal projects and commitments, (iii) the desire to connect with others, and (iv) the demands arising from interpersonal relationships. The goal of this paper is to investigate whether, to what degree, and how autopoietic enactivists can account for processes of meaning-generation that do not immediately affect our biological well-being. We argue that none of the approaches in the offing can account for all aspects of these experiences of normativity. We suggest that what is needed is an account that combines an appeal to the meaning-generating qualities of social interactions ('participatory sense-making') with an appeal to the normative force resulting from having a certain self-image as someone who cares.

Wahn:

GROUP BENEFITS IN A COLLABORATIVE MULTIPLE OBJECT TRACKING TASK

Basil Wahn, Department of Psychology, University of British Columbia

Alan Kingstone, Department of Psychology, University of British Columbia

Peter König, Institute of Cognitive Science, University of Osnabrück & University Medical Center Hamburg-Eppendorf

Abstract: Humans frequently perform visual tasks together such as solving puzzles together or looking for a friend in a crowd. In such tasks, humans often distribute task demands, enabling them to reach a higher joint performance compared to performing the same task alone — a group benefit. Research on group benefits in joint visual tasks has identified several factors that influence group benefits such as, for instance, performance feedback or information about the performed actions of co-actors. Yet, no study has systematically mapped out how increases for these two types of information enable groups to attain group benefits. We tested how performance feedback as well as information about the performed actions of co-actors affect group benefits in a joint multiple object tracking task in a series of eight experiments. We find that co-actors require performance feedback (either individual or team performance feedback), or information about the actions of co-actors, to attain group benefits. However, for co-actors to actually collaborate, they require team performance feedback or information about the actions of the co-actor. In a linear model predicting group benefits, we find that the information about the actions of co-actors has a higher influence on group benefits than team performance feedback, suggesting that the action information could be more important for co-actors to collaborate than team performance feedback. Collectively, the results of the present study provide an important step towards understanding how several factors influence group benefits in joint visual tasks.

Weidemann:

INVESTIGATION OF FRUSTRATION TOWARDS PRODUCTIVE HUMAN-ROBOT INTERACTION

Alexandra Weidemann, TU Berlin

Nele Russwinkel, TU Berlin

Abstract: One goal of human-robot interaction research is to create a pleasant and productive interaction between humans and robots. A negative emotion that often occurs when human interacting with technical devices like a robot, is frustration. Knowledge about what frustration is, how it arises and how it can be measured is a basis for understanding the concept of frustration. This could be used to create interaction with a technical device, for example a robot, more enjoyable and satisfying for the user.

In this paper, it was examined what kind of subjective (questionnaires) and objective methods (electromyography and electrocardiogram) best reflect the feeling of frustration. In a counting-triangle-task, the emotion was induced by manipulated feedback. The induced frustration could be detected with the questionnaires. However, in psychophysiological measurements results were not significant.

In order to find out more about the suitability of the used methods, they should be investigated in more detail in similar tasks in real interaction between human and robots.

Werning:

RELEVANCE VS SIMILARITY: BAYESIAN PRAGMATICS PROVIDES THE BEST QUANTITATIVE MODEL FOR EEG AND CLOZE DATA ON CONTEXTUAL MODULATION IN A PREDICTIVE COMPLETION TASK

Prof. Dr. Markus Werning, Ruhr-Universität Bochum

Mathias Unterhuber, Ruhr-Universität Bochum

Abstract: We contrast three quantitative models to explain the contextual modulation of a word's meaning and how it affects probabilistic predictions on the completion of a discourse. The Semantic Similarity Model presupposes that the predictor for a word given a preceding discourse is their semantic similarity. The Relevance Model maintains that utterances are chosen to maximize relevance. The Bayesian Pragmatic Model accounts for the rational cooperation between speaker and listener using Bayes's Theorem. In a Cloze test, we measure a word's probability following a preceding discourse. In an EEG study, we record its event-related potential and take the N400 component to be inversely correlated with its predictive probability. In a regression analysis, the proportions of variance explained by each model are compared with regard to both, Cloze values and N400 amplitudes. The Bayesian Pragmatic model turns out to best explain the data.

Weston:

THE EFFECT OF DIFFERENT TYPES OF PHYSICAL ACTIVITY ON THE TEMPORAL ORGANIZATION OF SPEECH

Heather Weston, Laboratory Phonology Group , Leibniz-Zentrum Allgemeine Sprachwissenschaft, Berlin

Susanne Fuchs, Leibniz-Zentrum Allgemeine Sprachwissenschaft, Berlin

Abstract: People often combine speech and body movements, such as walking while speaking, yet there is surprisingly little work exploring how body movements affect the temporal structure of speech. Breathing may mediate between speech and physical activity: it is a shared resource, providing oxygen for muscles and expiratory airflow for speech. With greater physical effort, breathing frequency increases and may thus constrain how speech is organized in time. To test this, we conducted two exploratory experiments testing 1) whether different effort levels and 2) different limbs affect speech rate and the duration of speech chunks and pauses.

Spontaneous speech (≈2 min.) was elicited and acoustic, respiratory and motion capture data recorded for adult German speakers. Experiment 1 (n=11; 1 male) tested three experimental conditions of increasing physical effort using an exercise bike from no to moderate to strenuous effort. Experiment 2 (n=15; 7 males) used a minibike (light effort) to test the effect of different limbs (hand- vs. foot-pedaling while speaking).

In Experiment 1 strenuous effort significantly reduced speech chunk duration and increased speech rate and pause duration. But in Experiment 2, light activity significantly *increased* speech chunk duration during foot-pedaling only; speech rate and pause duration were unaffected. These results suggest that strenuous physical effort leads to faster but less speech (longer pauses, shorter speech chunks), while light activity leads to longer speech chunks. Results also suggest that movements of different limbs may affect speech output in different ways during self-paced activity; further testing, also under effort, is needed.

Wolf:

FINDING A POINT OF VIEW – THE ROLE OF SELF AND OTHER IN UNDERSTANDING PERSPECTIVES

Julia Wolf, Ruhr-Universität Bochum

Abstract: There has long since been debate concerning the question of whether self-understanding precedes understanding others. In this paper I will focus on the narrower issue of understanding perspectives and consider how self and other relate to each other in the development of understanding perspectives. Using a three-fold distinction between having a perspective (self), taking a perspective (other) and understanding perspectives, I make two central claims in this paper. Firstly, I will argue that an understanding of perspective requires both self and other perspective, although taking a perspective (third person) and having a perspective (first person) may be prior, independent abilities. While it seems uncontroversial that someone might have a perspective without understanding perspectives, it has often been assumed that being able to take another's perspectives is sufficient to demonstrate understanding of perspectives. There is evidence, however, that in taking another's perspective, young children are still confined to only that perspective and are unable to relate this to other perspectives (including their own) (Moll et al., 2013). I argue that this suggests that perspective taking is not sufficient for perspective understanding as perspective understanding requires understanding that there are multiple ways of view one and the same thing. Secondly, I argue that putting together self and other perspectives is only possible through a shift from more object centred representations to more person centred representations. It is through recognising a perspective as *my* perspective as opposed to *her* perspective that it is possible to reconcile conflicting perspectives on the object.

ABSTRACTS

POSTER SESSIONS – Monday

1 – 43

(numerical order)

1 A Bi-Dimensional Model of Subjective Agency

Antonella Tramacere, Max-Planck-Institute for the Science of Human History, Jena

Abstract: At which level of sensorimotor complexity, performing intentional actions is associated with the subjective experience of agency? I answer this question by dissecting the sensorial and motor features involved in the execution of various types of actions. I build a *developmental and bi-dimensional model of agency*, which represents the action-perception properties of one single agent's action at a time *t*. Specifically, the x axis represents the properties of cue discrimination associated with the execution of the considered action. The x axis spans from 0, which represents one fix type of poorly discriminated stimulus triggering a response, to 1 that is the capacity of second-order monitoring of perceptual data (i.e., error correction). The y axis represents the flexibility of motor responses, from reflex and stereotypic movements (expressed by values close to 0) to a flexible action, including capacity of inhibitory control (expressed by value 1). Importantly, the bi-dimensional model of agency is suitable to make predictions on the development of subjective states, because by relying on the results of various experiments (Clark and Squire 1998; see Travers et al. 2018 for a discussion), we can highlight how specific subjective experience are connected to the requirements of action control.

2   Aᴇꜱᴛʜᴇᴛɪᴄ Exᴘᴇʀɪᴇɴᴄᴇ ᴀꜱ Aꜰꜰᴇᴄᴛɪᴠᴇ Aᴄᴛɪᴏɴ Cᴏɴᴛʀᴏʟ ɪɴ ᴀɴ Iᴅᴇᴏᴍᴏᴛᴏʀ Aᴘᴘʀᴏᴀᴄʜ

         ʙʏ Pᴏꜱɪᴛɪᴠᴇ/Nᴇɢᴀᴛɪᴠᴇ Fᴇᴇᴅʙᴀᴄᴋ ᴀʙᴏᴜᴛ ᴛʜᴇ Qᴜᴀʟɪᴛʏ ᴏꜰ Cᴏɢɴɪᴛɪᴠᴇ Mᴏᴅᴇʟʟɪɴɢ

Klaus Schwarzfischer, INDUKT Design-Institut, Regensburg

Abstract: Aesthetic experience is reconsidered due to embodied/enactive cognition. Linear cognitivist schemes (input-processing-output) do not suffice. The *ideomotor approach* (where action is *epistemic action*) offers a wider range of validity than the *sensorimotor approach*. Aesthetic experience is here an evolutionary reinforcement of learning processes (from enactive interoceptions up to mental operations): *Pragmatic action* works also as *epistemic action*. It induces sensory input for optimizing cognitive models to predict action effects. Aesthetic experience appears when the agent evaluates the quality of modelling processes (efficacy and efficiency). Intensional models are sparse (with *relief of neural resources*), and the model's range of validity is larger than the extensional data's. This enables the agent to dissolve occlusions (*decentering*) and to model expectations (*forward modelling*) and/or hypotheses about earlier states (*inverse modelling*). Both qualities (*relief of resources* and *decentering*) are evaluated by biological systems. The outcome of these evaluations are aesthetic experiences — signifying successful modelling processes (positive aesthetic experiences) or failing processes (negative aesthetic experiences). What is maximized is not the external world but the cognitive model (in its range of validity and its capability to minimize prediction errors). Hence, the observing system must be active in order to maximize asthetic experience. Aesthetic experiences can be found in different modes and granularities. They are more relevant in higher-order levels of larger scale. Finally, the *possibility space of aesthetic experience* is developed which is able to explain incompatible aesthetic preferences within a common theoretical framework (e.g. enactive, iconic, and/or symbolic operations).

3   xxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxx

4   MOTOR-SENSORY RECALIBRATION FOR MOTOR-AUDITORY AND MOTOR-VISUAL EVENTS

Belkis Ezgi Arikan, Giessen University

Bianca M. van Kemenade, Marburg University

Katja Fiehler, Giessen University

Tilo Kircher, Marburg University

Knut Drewing, Giessen University

Benjamin Straube, Marburg University

Abstract: Adaptation to temporal lags between our own actions and their sensory feedback is crucial to maintain a coherent sense of self and establish causality. Although extensively investigated, the exact mechanism underlying motor-sensory recalibration remains to be elucidated. While some studies found motor-sensory recalibration irrespective of the recalibrated modality suggesting a supra-modal mechanism, others showed evidence that recalibration takes place only for the sensory modality being recalibrated to the action. Moreover, traditional measures of motor-sensory recalibration might not reflect real life situations. In the present study, we examined the existence of supra-modal and multiple timing mechanisms for motor-auditory and motor-visual events using a delay detection task. At exposure, participants initiated button presses triggering a beep or a Gabor patch that was either presented immediately or lagged in time by 150ms. They were then asked to detect action-feedback delays of 0-334ms, either within the recalibrated modality or for the non-recalibrated modality. We found motor-sensory recalibration (shift in the point of subjective equality when a lag was present) only within the adapted modality. This modality-specific recalibration effect was not as consistent in the visual domain as it was in the auditory domain. In addition, we found no significant differences in the just noticeable differences, suggesting that the task was equally difficult across lags and modalities. These results indicate the existence of multiple timing mechanisms informed by learned action-feedback associations in recalibrating time between our own actions and the sensory events, and provides support for the dominance of the auditory modality in judging time.

5 ON THE IDEOMOTOR PRINCIPLE OF GOAL-DIRECTED AUTOMATICITY OF HABITS: EVIDENCE FOR SPONTANEOUS ACTION-OUTCOME LEARNING

Dan Sun, Ruud Custers, Hans Marien, Henk Aarts

Department of Psychology, Utrecht University, Utrecht, The Netherlands

Abstract: Human habits can be conceptualized as goal-directed behaviors that are automatically selected and initiated upon the activation of a goal. Such automaticity in goal-directed behavior follows from Ideomotor Theory, according to which merely perceiving or thinking of an outcome-event can lead to the automatic selection and initiation of the habitual action that repeatedly produced this outcome in the past. Associations between actions and outcomes that underlie this phenomenon are assumed to develop spontaneously during repeated action execution. In the current project we test this automaticity feature of ideomotor learning. In three experiments, participants completed the same learning phase in which they acquired action-outcome associations, and were either explicitly informed about the contingency between actions and outcomes, or not. Automatic action selection and initiation were investigated using a free-choice task in Experiment 1 and forced-choice tasks in Experiment 2a and 2b. An ideomotor effect was only obtained for the free-choice, but not for the forced-choice tasks. Together, this suggests that action-outcome relations can be learned spontaneously, but that there may be limits to the automaticity of the ideomotor effect: Cues in the environment that bring to mind an outcome may not trigger behavior directly, but rather bias people towards selecting habitual actions. We maintain, however, that such habitual biases in implementing goal-directed behavior may still very well be the mechanism that drives habits in daily life.

6 THE IMPACT OF PREDICTIONS AND SENSORY INPUT ON THE SENSE OF AGENCY: DEVELOPMENT OF A NEW PSYCHOPHYSICAL PARADIGM

Hiroaki Mizuhara, University of Glasgow, Kyoto University

Peter Uhlhaas, University of Glasgow

Abstract: Subjective feelings that action outcomes are driven by one's own action are called "the sense of agency". This study evaluated the extent to which predictions and visual perception contribute to the sense of agency with a novel psychophysical task, in which we manipulated the degree of visual feedback in a computer task to trace a target by a mouse cursor. The results showed both prediction and perception factors modulated the sense of agency. In addition, these effects showed correlations with schizotypal symptoms which was measured by the Schizotypal Personality Questionnaire. Our results demonstrated that both visual perception and predictive processes are crucial for inducing the sense of agency and that these are modulated by schizotypal symptoms.

7   THE TEMPORAL DYNAMICS OF ACTION-EFFECT PREDICTION: AN EEG STUDY

Elisabeth Lindner, CNRS & Université Paris Descartes & German Primate Center, Göttingen

Alvaro Darriba, CNRS & Université Paris Descartes

Qing Yang, CNRS & Université Paris Descartes

Alexander Jones, Middlesex University London

Florian Waszak, CNRS & Université Paris Descartes

Andrea Desantis, CNRS & Université Paris Descartes & ONERA, Salon-de-Provence

Abstract: The effects of self-initiated voluntary actions are found to be attenuated in their phenomenology and their cortical response. This phenomenon of sensory attenuation has been assigned to motor-based sensory prediction. However, it remains unclear when such action-effect prediction is generated and whether it is related to late motor preparation and motor execution or to early motor preparation. The present study investigates at what time action-effect prediction, as reflected in sensory attenuation, emerges. Therefore event-related potentials to self-initiated sounds were recorded with electroencephalography in healthy participants. First, during a learning phase, participants acquired an association between two self-initiated key presses and their respective sounds. Subsequently, those sounds were presented between a cue, instructing a left- or a right-handed action, and the self-initiated action. They either respected (congruent sound) or violated (incongruent sound) the association acquired in the learning phase. Sounds were presented at different time points before action execution. Factorial analysis revealed a significant interaction between the congruency of the sound and time of sound presentation before action onset for N1 and P2 event-related potentials. Amplitudes for congruent sound presentation significantly decreased for N1 the closer the sound was presented towards movement onset compared to the amplitudes for incongruent sounds, which indicates that congruent sounds are attenuated compared to incongruent sounds at time points closest to the action (around 232ms before action). Those findings suggest that action-effects are already represented before movement onset, at late motor preparatory stages.

8 USING NEUROFEEDBACK TO STUDY THE EFFECTS OF INTER-BRAIN SYNCHRONIZATION ON JOINT ACTION PERFORMANCE

Marius Zimmermann, DTU Compute, Copenhagen

Arianna Schiano Lomoriello, DTU Compute, Copenhagen

Ivana Konvalinka, DTU Compute, Copenhagen

Abstract: People that are engaged in social interaction tend to synchronize their behavior both intentionally and spontaneously. A series of neuroimaging studies has also shown emergence of inter-brain synchronization in socially interacting people. Most studies so far have reported inter-brain synchronization in response to synchronized overt behavior or in tasks where the interacting partners had similar sensorimotor input. Therefore, the functional importance of inter-brain synchronization remains unknown. To date, only a single study aimed to investigate the causal contribution of inter-brain synchronization on interpersonal coordination using brain stimulation (Novembre et al., 2017). However, the use of brain stimulation likely induced non-natural neural oscillations, and the study may not have distinguished between synchronized and non-synchronized brain activity, but rather, between in-phase and anti-phase locked activity. In this study, we will use two-brain neurofeedback to enhance (or prevent) inter-brain synchronization before actors engage in a joint action task. Joint action performance (coordinated movements) will be compared between conditions of inter-brain synchronization and conditions where the inter-brain rhythms are uncoupled, and in contrast to baseline performance. The results of this study will provide a new tool to investigate the mechanism of inter-brain synchronization and enhance our understanding of the functional role of inter-brain synchronization in the context of social interaction.

9   VICARIOUS SENSE OF AGENCY IN HUMAN-ROBOT INTERACTION

Cecilia Roselli, Italian Institute of Technology, Genova; University of Genova

Francesca Ciardo, Italian Institute of Technology, Genova

Agnieszka Wykowska, Italian Institute of Technology, Genova

Abstract: Sense of Agency (SoA) is the feeling of having control on a specific action. According to literature, humans experience reduced SoA in the presence of other humans; however, this effect has not been observed when interacting with a computer program. In this framework, it is important to investigate whether the effect of reduced SoA is observed with embodied robots.

I will present an experimental paradigm designed to assess whether robots can elicit vicarious SoA during joint tasks. In two experiments, participants perform an Intentional Binding task alone or with the Cozmo robot (Anki Robotics).

They have to report the position of a rotating clock-hand when a self- or Cozmo generated critical event (i.e. an action or an auditory tone) occurs. In Experiment 1, Cozmo actually performs a real action (i.e. a keypress), as human participants do. In Experiment 2, participants are told that Cozmo sends a command to the keyboard via Bluetooth, i.e. it does not actually perform any action.

Our dependent measure is the Judgement error (JE), i.e. the difference between the actual position of the clock hand and the position reported by the participants. Preliminary results showed that JEs differed from the respective baseline, indicating that a binding effect occurred. Interestingly, no effect of the social context was found, suggesting that the binding effect was similar when participants performed alone or with Cozmo. Together this preliminary evidence suggests that robotic agents can elicit a vicarious SoA, similarly to when interacting with human agents.

10   WHAT IS AGENCY? AN EMPIRICALLY INFORMED MINIMAL ACCOUNT

Florian Teichmann, University of Leipzig

Abstract: On my poster I will present the theoretical outline of my Ph.D. project. I will make a three-step argument for the need of an empirically informed minimal account of agency. First, I will argue that recent theories of action suffer from over-intellectualization. Second, I will argue that a minimal account will help to overcome this problem. Third, I will show how a behavioral paradigm experiment can help to develop this account. This project is genuine interdisciplinary, bringing together developmental psychology and philosophy of action. It will help to overcome a severe problem for causal theories of action, and it will provide new results to early childhood empirical research.

11   MODELLING AD HOC CONCEPTS IN CONCEPTUAL SPACE: AN INTRODUCTION

Davide Coraci, University of Genoa

Abstract: The *Conceptual spaces* model (CS) represents cognitive phenomena geometrically (Gärdenfors 2000, 2014). It works at an intermediate level of representation, between the higher symbolic and the lower level of neural networks and presents a high flexibility in storing information – e.g. concepts, properties, categories and context salience. For these reasons, this model is particularly suitable for representing *ad hoc* concepts, i.e., occasion-specific mental representations highly depending on contextual constraints and goals. Instead of common taxonomies, their graded structures depend on the contextual activation of two determinants, i.e. *ideal* and *frequency of instantiation* (Barsalou 1985, 1991). The aim of such a work is to investigate how to represent such determinants in CS, focusing on how they affect the geometrical features of CS. Finally, I propose a sample of the construction of an *ad hoc* concept (e.g., TRANSPORTATION FOR GETTING FROM SAN FRANCISCO TO NEW YORK) derived from the representation of a common taxonomy (e.g., VEHICLE).

12   Some Possibilities for Axiology in AI

Wanja Wiese, Johannes Gutenberg University Mainz

Abstract: This paper is about axiological problems in population ethics and automated decision-making. I will argue that some problems in population ethics have relevant counterparts in those parts of AI research that involve automated decision-making. Consequently, potential solutions to problems in population ethics have analogous solutions in AI research. A more general point is that research in AI ethics can benefit from research in population ethics. Research in population ethics shows that certain general assumptions about value and value aggregation have repugnant implications (see Parfit, 1984; Arrhenius, 2000). To the extent that decisions automatically made by artificial systems are based on comparing the values of different options, analogous conclusions can be drawn for automated decision-making. A similar point has recently been made by Peter Eckersley (2019), who suggests addressing this problem by building uncertainty into artificial systems (cf. also Bogosian, 2017). Drawing on an analysis by Teruji Thomas (2018), I will argue that Eckersley's proposal can be complemented using algorithms with lexicographic value functions (cf. also Carlson, forthcoming).

13   THE RELATIONSHIPS OF OVERLAP AND CONTAINMENT IN THE SEMANTIC HYPERNETWORK

Kaoutar Skiker, National School of Applied Sciences, Tangier

Mounir Maouene, National School of Applied Sciences, Tangier

Abstract: This work presents the hypernetwork model to describe the categorical structure in humans. The hypernetwork consists of nodes which correspond to the names of concrete objects and hyperedges that correspond to clusters of semantically related objects. The principal characteristics of the hypergraph are: (1) each object has distinct features (2) features are the driving for grouping objects into clusters (3) Each cluster reflects related objects by a distinct feature (4) Each object belong to more than one cluster because it has several features. Our findings show that the hypernetwork has the capacity to identify naturally the overlapping clusters, the containment and feature path from specific to general clusters. We believe that the hypernetwork represents an original way to characterize the categorical system in humans and may help arguably AI researchers think differently about the modeling of conceptual knowledge.

14   THE NEUROCOGNITIVE SOLITION (NCS) HYPOTHESIS

Harald Maurer, University of Tübingen

Abstract: The core of my second dissertation project is to investigate to what extent the concept of neuronal solitons in wave field theory using standard integro-differential equation (IDE) is suitable for solving the binding problem in the cognitive neurosciences and cognitive science ("Binding-By-Synchrony Hypothesis" and "Communication Through Coherence (CTC) Hypothesis"). The aim is to construct phase-synchronized, transient mechanisms creating compositional and systematic, recursive structures in language and visual processing. The nature of this "vectorial form" of such a "liquid", "fluid" or "fluent Neurocognition" can be illustrated by means of a metaper, referred to as the "Mountain Lake and Mountain Creek Metaphor." Thus, the mode of neuronal information processing in the human brain and therefore in the functioning of the human mind can be best modeled by self-excited, selfamplifying and self-sustained waveforms superimposing each other in multiple-coupled feedback cycles.

15   AGE-DEPENDENT INFLUENCES OF GENERAL ANAESTHESIA ON THE COGNITIVE ABILITIES IN LONG-TAILED MACAQUES (*MACACA FASCICULARIS*)

Lena Jeanson, German Primate Center, Göttingen

Abstract: Increasing life expectancy and advances in medicine are resulting in a growing number of elderly patients undergoing surgery under long-lasting general anaesthesia. Such long-term anaesthesia may particularly impact the cognitive abilities of aging humans (post-operative cognitive dysfunction, POCD) but until now, the underlying mechanisms remain unclear. The present study aimed to establish a non-human primate model for POCD by testing the physical and social cognitive abilities of young and old long-tailed macaques (*Macaca fascicularis*) before and after general anaesthesia (N = 13). Our study examined if general anaesthesia with isoflurane in the first part and with propofol in the second part of the study influenced cognitive abilities and if these effects were age-dependent. Statistical analysis did not reveal significant effects of age or anaesthetics on performance levels in physical and social cognitive tests which contradicts findings of cognitive impairment after general anaesthesia in humans. Further studies need to clarify whether the test battery may not be suited to detect and quantify impairments, or whether long-tailed macaques are generally less susceptible than humans to such cognitive impairments after general anaesthesia.

16   MOLYNEUX'S FISH – OBJECT FEATURES IN ACTIVE ELECTROCEPTION

Thede Witschel, University of Tübingen

Hanspeter Mallot, University of Tübingen

Abstract: Is the object representation based on features from one sensory modality enough to recognise the object using a different sense, if no interaction between these senses has happened so far? William Molyneux proposed this problem to John Locke, asking if it is possible for a blind person to tell a globe from a cube if she has explored the object by touch and only just now acquired a visual sense.

We address the question of modality-general vs. modality-specific processing in a sensory modality, which is "exotic" to humans, i.e. active electroception, a sensory system found in different families of fish. Objects with electrical conductivity different from the surrounding water will distort the electric field generated by the fish. Electroreceptors in the skin of the fish analyse the electric field and the fish is able to distinguish between different objects based on the electroreceptor signal. It is not clear however, which types of object properties (position, volume, shape, conductivity of the material, motion etc.) are reflected in the electric field distortions in a way that can be analysed by the fish brain.

Since the distribution of the electric field distortions on the fish skin is hard to measure at high resolution, we developed a simulation based on Poisson's equation and the method of finite elements to solve the partial differential equation describing the quasi-electrostatic case of a simulated fish generating electric potentials.

The simulation allows us to simulate stimulus patterns as would be generated on the skin of the fish and analysed by electroreceptors located in the skin of one such animal, in details, that were not yet able to be measured using conventional methods. With stimulus patterns like these, we decided to first compare globes and cubes of similar volume and conductivity using approaches from machine learning and computer vision for both spatial and spatio-temporal patterns. Finally, we compare the describing features of globe/cube discrimination in electroception to features we know from vision.

17   Social Comparison in Long-Tailed Macaques – Competition Is Key

Rowan Titchener, German Primate Center, Göttingen

Abstract: Social comparison theory disentangles how and why humans modify behaviour and self-evaluations in response to conspecific presence and performance. Social psychologists have identified some distinct patterns of behaviour that arise following social comparison. For instance, people who carry out a task in the presence of a slightly better-performing co-actor assimilate their performance toward that of the superior standard. In the present study, we adapted an experimental paradigm from social psychology to study social comparisons in long-tailed macaques (*Macaca fascicularis*). Subjects were given the task of opening baited drawers in a test apparatus in order to retrieve food rewards. We tested if the monkeys' response latency (time between drawer pulls) was influenced by different experimental contexts. The apparatus was mounted between two cages such that a subject and a conspecific could simultaneously access drawers. Subjects experienced three conditions: *Social* (active conspecific foraged opposite subject), *Ghost* (no conspecific opposite, instead an obscured experimenter pulled drawers open via strings) and *Social control* (conspecific opposite but this monkey was denied access to the drawers). We manipulated the competitiveness of the setup. The monkeys did not alter their pulling rate in response to the mere presence of a conspecific; they did, however, when reward acquisition was a contest. We conclude that if social comparison processes exist in this species, they are linked to direct competition contexts; this differentiates this species from humans as we also engage in social comparison in merely evaluative contexts.

18   COORDINATING INVESTIGATIONS IN THE FIELD OF COGNITIVE ANTHROPOLOGY

Benjamin Reimann, University of Leipzig

Abstract: The wide field of cognitive anthropology combines approaches from different disciplines, such as philosophy, psychology, (neuro-)biology, linguistics, pedagogy, comparative cultural research, paleogenetics and others. But taking a closer look at the relations between the disciplines participating in this dialogue, it seems that rather than cooperating in a coordinated way, they are mainly operating in parallel, with some lucky intersections. What is missing is a theoretical foundation for a genuinely interdisciplinary strategy, which turns simultaneous research into cooperate investigations.

My talk aims at addressing this problem. I suggest a theoretical model, which can serve as a framework for coordinating different disciplines participating in the field of cognitive anthropology. By doing so, the relevant disciplines named above will be brought into a theoretical relationship with each other. The basic idea is that what is needed is a fundamental question, which can be shared by all disciplines and which can be used as a kind of compass for navigating research activities. The question needed was formulated by Michael Tomasello (2009), but the suggested interpretation is based on Aristotle (Transl. 1963, B 194b ff.): *Why do we cooperate?*

My claim is that if we understand Tomasello's question as an open question and interpret it with the help of Aristotle's doctrine of the four causes, we will arrive at the coordinating strategy we are looking for. Importantly, in doing so we have to be aware of our constitution as political human beings that are not only cooperating for the purpose of surviving, but for the purpose of a good live as the application of Aristotle's doctrine reveals it.

19   A NEW INTERACTIVE TASK TO STUDY EARLY FALSE BELIEF UNDERSTANDING

Lisa Wenzel, University of Göttingen

Pamela Barone, University of the Balearic Islands, Human Evolution and Cognition Group (EvoCog), UIB, IFISC, Associated Unit to CSIC.

Marina Proft, University of Göttingen

Hannes Rakoczy, University of Göttingen

Abstract: The standard false belief task (FBT), which children master at the age of four, has been the litmus test of Theory of Mind (ToM) competences (Wellman, Cross, & Watson, 2001). Recently, several studies questioned this traditional picture showing, through spontaneous-response measures, that infants understand another person's behavior based on her true and false beliefs (see Baillargeon & Scott, 2010 for a review). However, issues of replicability and validity of these tasks remain (Powell et al., 2018). In the present study, we test 33- to 39-month-olds in a new task aiming to disentangle conflicting theoretical approaches that can explain young children's success in spontaneous-response FBTs: belief vs. ignorance ascription accounts. In our test, participants have to anticipate an agent's behavior and help her reaching an object. To do so, participants have to consider whether the agent (1) holds a true belief about the final location of her object, (2) a false belief, or (3) was ignorant about the location of the object. Each child participates in all three conditions and we measure children's interactive behavior, latencies of this action as well as anticipatory looking. Preliminary results indicate that children adjusted their interactive behavior according to the agent's belief and were more hesitant in the ignorance than in the FB condition. So far, results favor the mental state attribution interpretation of 33- to 39-months-old children's performance.

20 WHEN DO CHILDREN APPRECIATE THE SUBJECTIVITY OF DESIRES?

Lydia Paulin Schidelko, University of Göttingen

Britta Schünemann, University of Göttingen

Marina Proft, University of Göttingen

Hannes Rakoczy, University of Göttingen

Abstract: Recent empirical (Smith & Warneken, 2014; Yuill et al., 1995; Priewasser et al., 2013; Ostojić et al. 2018) and theoretical work (Perner & Roessler, 2010; Perner et al., 2018) cast substantial doubt on the view, that children understand desires ontogenetically earlier than beliefs (asymmetric view). Assuming a teleological reasoning strategy, they argue that the evidence supporting an asymmetric development can be explained by a goal-directed objective reasoning strategy. The ability to really appreciate desires as subjective conative states requires overcoming the notion of objective desirability which develops in tandem (symmetric) with the subjective notion of belief.

The present project compares children's understanding of wicked desires, which due to their conflict with objective desirability requires subjective reasoning, to neutral desires, which can be ascribed employing an objective reasoning strategy. Avoiding the indirect measurements of earlier studies, we assessed children's understanding via memory-for-complements-tasks. These confront children with protagonists expressing propositional attitudes (here: wicked and neutral desires) that later turn out to be false/unfulfilled (DeVilliers & Pyers, 2002). Children have been found to fail repeating propositions for states they do not yet have a concept for (Perner et al., 2003).

The rationale is the following: asymmetry views predict that 3-year-olds master both neutral and wicked desire tasks even though they fail established false belief tasks. In contrast, the symmetry account implying a simultaneous understanding for both conative and cognitive propositional attitudes, predicts that children pass neutral desires while failing wicked desire and false belief tasks.

21 CHILDREN'S ASSOCIATIONS BETWEEN SPACE AND NUMBER CAN BE BIASED BY PHYSICAL SIZE

Sarah Dolscheid, University of Cologne

Heiko Verlage, FOM University of Applied Sciences, Münster

Abstract: In Western cultures, people seem to represent numbers horizontally, from left to right. This association has been demonstrated by the so-called SNARC-effect (Spatial-Numerical Association of Response Codes; Dehaene, Bossini, & Giraux, 1993), in which adult participants respond faster to larger numbers with their right hand and to smaller numbers with their left hand. SNARC-like effects have also been reported for preliterate children in non-symbolic number comparison tasks. However, it is unclear whether children's spatial-numerical associations are exclusively based on number information or whether non-numerical factors such as stimuli size can also play a role. To address this question, we asked preliterate children to compare quantities in a non-symbolic number comparison task in which number information and physical size were juxtaposed. On half of the trials, the larger set of dots took up more total surface area (congruent trials), and on the other half, the smaller number of items had more total surface area (incongruent trials). Our results revealed a significant interaction of children's spatial-numerical associations and congruency. That is, SNARC-like effects were only obtained for congruent trials in which size and number corresponded, but not during incongruent trials. Taken together, our findings reveal that preschoolers' spatial-numerical associations of response codes can be affected by physical size, thereby contributing to the broader question of how numbers and non-numerical magnitude relate.

22 GRASPING NUMBERS WITHOUT OUR HANDS

Jean-Charles Pellard, New College of the Humanities, London & McGill University, Montreal

Abstract: Despite the tremendous progress made in the study of numerical cognition in recent years, an important question remains: given the precision and size limitations of our innate numerical systems, how do we manage to develop arithmetically-viable nusmerical content? To explain how we bridge this content gap, many have adopted a form of externalism about cognition, emphasizing the important role played by extracranial objects and symbols in the historical and ontogenetic development of arithmetic. In this talk, I argue that this externalist approach is incomplete. To make my case, I focus on Lambros Malafouris' brand of externalism, *Material Engagement Theory* (2010, 2013).

Combining elements of enactivism and embodied cognition, Malafouris (2010) argues that the manipulation of clay tokens was essential to the development of arithmetical practices in ancient Sumeria. On this view, the development of manual accounting techniques that led to the abstract representation of precise quantities of objects shows that material engagement with cultural artefacts is a necessary precursor to an abstract representation of number.

Against this, I claim that manipulating tokens for accounting purposes presupposes possession of the content PRECISE QUANTITY, whose origin is left unexplained in externalist approaches. I argue that Malafouris, like other externalists, cannot give a full account of the initial development of numerical content by inquisitive individuals in a numeral-free environment. I illustrate the limitations of externalist accounts by appealing to difference-making features of explanations (Clark 1998s) and applying these to anumeric cultures like the Piraha and Mundurucu.

23   How Young Minds See Future Minds: Uncanny Valley and Ascription of Different Types of Attributes to Robots

Robin Kopecky, The Karel Capek Center for Values in Science and Technology, Charles University, Prague

Michaela Košová, The Karel Capek Center for Values in Science and Technology, Charles University, Prague

Abstract: Nowadays interactions between child and machines are being studied on both philosophical and technical levels. In our interview study with children and teenagers (N=209) we decided to test the children's reaction to different types of robots. Firstly, the children were shown pictures of 6 different robot faces on the spectrum from the most robotic to the most human-like face. The children were supposed to judge how much the particular face appears friendly to them. As we hypothesised, in the resulting graph we observed an obvious uncanny valley.

Secondly, the children were asked to judge whether they would ascribe certain attributes (sense perception, thinking, emotions, self-reflexion, life, soul and freedom) to different entities: dog and child, a robot with basic perception, motor and mathematical abilities that can also talk, and a robot who is also capable of being an active participant of a dialogue and can communicate in a way indistinguishable from a real person. The results show that the children are capable to ascribe certain level of cognition, emotions and even freedom to sufficiently complex robots, but are still reluctant to see robots as living beings with a soul. The concept of the soul may be understood as an essential moral core of the person that is capable of moral conduct and deep interpersonal bonds and which is conceptualized differently than the mind. Despite their behavioural complexity and intelligence, robots might not manage to cross the boundary between machines and full-fledged persons in the eyes of children.

24   The Cognitive-Development Approach to Event Cognition: Age Differences in Detection of Event Boundaries and in Creation of Event Models

Vladimir Glebkin, Russian Presidential Academy of National Economy and Public Administration; School 1514, Moscow

Ekaterina Olenina, School 1514, Moscow

Abstract: Event cognition is a rapidly developing and promising research area. Meanwhile, some domains are not considered in detail in this scope. In particular, event cognition is not precisely explored from the perspective of cognitive development. In this paper, we compare the capacity to cut a visual narrative into events for kindergarten students, primary school students, high school students and adults. "The pear film" by W. Chafe (1975) is used as the material for our experiment. We also examine a correlation between event comprehension and other cognitive skills for primary school students. Our work provides clear evidence that, in contrast with high school students and adults, kindergarten students and primary school students perceive visual narrative on the surface level.

25 **THE DEVELOPMENTAL TRAJECTORY OF LEFT-SIDE BIAS IN FACES AND CHINESE CHARACTERS PROCESSING: EVIDENCE FROM AN ERP STUDY**

Chenglin Li, Friedrich Schiller University Jena

Xiaohua Cao, Zhejiang Normal University, Jinhua

Abstract: The left-side bias (LSB) for face processing refers to how a chimeric face is created from the left side of a face (from the viewer's perspective) and its mirror image are considered more similar to the original face than a chimeric face created from the right side of the same face and its mirror image. Faces and Chinese characters both are expert stimuli for educated Chinese. Previous studies observed the LSB effect for them. However, it remains unclear for the developmental trajectory of the LSB effect of Chinese characters. More importantly, the neural mechanism of the LSB effect of them are still unclear. The present study used EEG method to investigate the developmental trajectory of LSB effects of them. Experiment 1a firstly adopted the sequential matching paradigm to explore the neural mechanism of the LSB effect of faces and Chinese characters in adults. In Experiment 1b, the Grade 2, 4, 6 children were selected to investigate their developmental trajectories. The behavioral results showed there is a stable LSB effect in faces and Chinese characters processing, and the Grade 2 participants reach an adult-like level. The EEG results show that the LSB effect of Chinese characters and faces are both related to the early cognitive processing components. But there are different development trajectories of LSB for faces and Chinese characters. Together, these findings suggest that although the LSB can be observed in faces and Chinese characters processing, the underlying neural mechanisms of this left-side bias might be a different characteristic.

26   AUTONOMIC REGULATION FOR GO-NO-GO TASK IN CHILDREN WITH ADHD

Sofia Polevaia, Privolzhsky Research Medical University, Nizhny Novgorod

L.V. Savchuk, Privolzhsky Research Medical University, Nizhny Novgorod

Kirill Nikolaevich Gromov, National Research Lobachevsky State University of Nizhny Novgorod

Sergey Parin, National Research Lobachevsky State University of Nizhny Novgorod

Alexandr Fedotchev, Russian Academy of Sciences, Pushchino

Abstract: ADHD is considered one of the most common neurobehavioral disorders of childhood and among the most prevalent chronic health conditions affecting school-age children. This makes research of psychophysiological correlates of ADHD very important. The aim of our pilot study was to find out the specific aspects of autonomic regulation of a simple sensorimotor activity in children with ADHD. To assess objectively the functional state dynamics of the children, the technology of event-related telemetry of the heart rate was used. Using ApWay.ru Web platform, 3 templates for measuring sensorimotor activity: 1 in elementary context and 2 «go/no-go» tasks were created. The conducted study allowed us to reveal some specific aspects of autonomic regulation for «go/no-go» task for children with ADHD. As the first, significantly greater strain of the autonomic regulation is manifested by ADHD group compared to the control group. Secondly, for children with ADHD, reduced levels of both sympathetic and parasympathetic activity became evident. With both primary and complex sensorimotor activity, such indicators as time of sensorimotor reaction, key hold time and number of stimulus skips for ADHD children, being compared to the control group are significantly higher. The task complexity factor affects the time of the sensorimotor reaction while it doesn't affect the key hold time. Unlike the control group, ADHD children reveal less connected indicators of sensorimotor activity and vegetative regulation; particularly, ADHD group is lacking of HF-HF/LF links, MR-SMR links for simple reactions, MR simple -MR complex reactions. There's a significant link between simple MR and sympathetic NS as for the controls (r=0,53) and for ADHD (r=0,98) groups, but it's much stronger for ADHD group.

27   NEUROFEEDBACK FROM SUBJECT'S EEG FOR CORRECTION OF STRESS-INDUCED STATES

Sofia Polevaia, Privolzhsky Research Medical University, Nizhny Novgorod

Alexandr Fedotchev, Russian Academy of Sciences, Pushchino

Abstract: The goal of the study is a comparative evaluation of the effectiveness of different kind of the neurointerfaces using single (sound) or double (lightsound) feedback from the human EEG when suppressing stress-induced states. Materials and Methods. In one of the three experiments, 14 stressed volunteers were presented with classical music (control). In the other two experiments, either single feedback was used, in which subjects are presented with sound stimuli obtained by converting the current values of EEG oscillators into music-like signals, or double feedback, in which the described music-like signals were supplemented by rhythmic light stimuli controlled by the raw EEG of the subject. Results. The most pronounced effects — a significant increase in the alpha EEG power relative to the background and significant positive shifts in subjective indicators — were noted under double feedback from subject's EEG due to the involvement of integrative, adaptive and resonance mechanisms of the central nervous system in the processes of functional state normalization. Conclusion. The use of the double audio-visual feedback from the human EEG appears to be a promising way to improve the effectiveness of neurointerfaces in correcting stress-induced functional states.

28   DISTRIBUTED REPRESENTATIONS - THE IMPORTANCE OF EYE MOVEMENTS IN MENTAL PROBLEM SOLVING

Marcel Dorer, University of Tübingen

Hanspeter Mallot, University of Tübingen

Abstract: Mental processing and motoric behavior are parts of an inseparable representation system, which is distributed across the internal mind and the external environment. This system provides the basis for accomplishing a multitude of cognitive tasks, such as problem solving. Eye movements, as a directed, motoric behavior, are of fundamental importance for cognition since they not only acquire information of the external environment, but also directly support mental processing (i.e. epistemic actions, imagery, etc.) during visuo-spatial problem solving. A variety of studies documented the importance of working memory in combination with the mutual interplay of eye movements and cognition during visuo-spatial problem solving. Nevertheless, neither the specific contribution of working memory nor the detailed purpose and function of eye movements during the mental solving of spatial problems are understood. A deeper investigation of those processes would be a substantial requirement to better describe and therefore understand mental problem solving. Utilizing a passive disk transfer task as modification of the spatial Tower of Hanoi puzzle, here, we linked eye movements with mental processing in (i) a variety of problem complexities and (ii) manipulations of stimulus accessibility. Furthermore, (iii) the individual working memory capacity was assessed using standardized memory tasks. Overall, participants were found to fixate systematically on stimulus areas in order to support mental problem solving. However, the degree of such externalization behavior varied between subjects, problem complexities, and manipulations. Comparing the variance concerning eye patterns, task performance, and working memory capacity, we provide new findings explaining individualized adaptations to distributed representations.

29   THE INFLUENCE OF SPATIAL FREQUENCIES ON NAVIGATION BY VISUAL GUIDANCE

Lilian Levinh, University of Tübingen

Hanspeter Mallot, University of Tübingen

Abstract: Our study investigated the importance of spatial frequencies on landmark based guidance. Though there is a preference of low spatial frequencies in scene recognition, landmarks have to be reliably recognized and high spatial frequencies are preferred in feature detection. We used composite videos of sceneries, which featured independently moving high and low spatial frequency filtered landmarks. Subjects in a virtual reality environment were then tasked to follow either high or low spatial frequency filtered landmarks. We varied the contrast of high and low spatial frequency elements and used two different sceneries with different landmarks and surroundings. Results show, that while performance was equal, subjects' spatial frequency preference differed with sceneries. Further subjects may have employed different strategies depending on the landmarks and their surroundings. Performance when both high and low spatial frequencies were distinguishable, was as good or better compared to when target spatial frequency was almost exclusively used. This may indicate subjects using both in guiding. Contrary to the general preference of low spatial frequencies in early recognition, subject reaction times were longer to low spatial frequency filtered landmarks, which may stem from a preference of high spatial frequencies in change detection and object analysis. However, an effect on reaction time was only observed in in one scenery. The results therefore suggest that, like in face processing tasks, usage spatial frequencies in landmark based guidance is flexible and may change with the nature of scenery and landmarks.

30   A New Connectionist Model for Grounding Spatial Prepositions

Igor Farkas, Comenius University, Bratislava

Ales Zagar, University of Ljubljana

Abstract: We address the problem of grounding spatial prepositions using a new connectionist three-layer bidirectional model trained by Universal Bidirectional Association Learning (UBAL) algorithm. UBAL was introduced recently as a biologically more plausible pattern associator, that avoids error propagation. Instead, only neuron activations are propagated bidirectionally. The weights update is applied to four weight matrices, is based on unit activation differences in both directions combined with an echo information, being a novel feature of the algorithm. Formally, the learning rule is based on Hebbian association of two terms derived from unit activations in both directions.

We tested UBAL on the task of associating (continuous) spatial information describing the absolute positions of two objects (the reference and the trajector) in 2D space, with (categorical) information expressed symbolically (linguistically) by a spatial preposition. We consider four major (most distinct) prepositions ("left-of", "right-of", "above", "under"), and three additional prepositions, for a trajector being closer to the reference ("on", "beneath" and "next-to", where the last one is horizontally ambiguous). The forward association is many-to-one (classification), whereas the backward direction is ambiguous. The simulations showed that UBAL was able to learn the bidirectional relationship, as tested on novel inputs (reaching forward accuracy around 90%). As a bidirectional model, UBAL can also generate prototypical spatial relationships for a given category. This backward mapping represents the grounding of spatial prepositions. Only the "next-to" prototype could not be learned due to the bimodal distribution of its instantiations. Currently, we test the UBAL model in more complex scenarios to see its potential.

31   IMMUNIZATION AGAINST DATA IN RESOURCE-CONSTRAINED OBSERVERS

Marcel Binz, Philipps-Universität Marburg

Dominik M. Endres, Philipps-Universität Marburg

Abstract: In psychology, immunization refers to the resistance to learn despite having access to the relevant information to do so. We build a computational model to study the conditions under which immunization occurs and are specifically interested in the hypothesis, that resource constraints of the human mind are a cause for immunization. Our analysis is based on a simple, sequential prediction task. We realize resource-constrained observers in this task with Recurrent Neural Networks, that are constrained with regard to their physical storage capacity (measured by the minimum number of bits it takes to represent model parameters). We find, that models with stronger constraints show immunization against more complex, high variance sequences, but not against simple, low variance sequences. Furthermore we highlight situations, in which resource constraints can lead to a change of preferences. The presented model provides a starting point for a better understanding of situations, in which human learning and decision-making violates normative principles, and we hope to establish connections to various experimental phenomena from psychology in future work.

32   NEURAL PRINCIPLES FOR MODELING RELATIONAL REASONING: LESSON LEARNED FROM COGNITIVE NEUROSCIENCE

Julia Wertheim, Albert-Ludwigs-Universität Freiburg

Marco Ragni, Albert-Ludwigs-Universität Freiburg

Abstract: The modeling of cognition has been a rapidly developing research field in the cognitive science community. This is because models of higher cognition enable us to implement theories about the mechanisms of human cognition and to test their outcomes and validity by simulation. Neuroscientific experiments can provide valuable data about the underlying brain activation patterns during a given task. Although both fields inform cognitive theories, the integration of both fields has been sparse. In this article, we aim at bridging the gap between the neurocognitive correlates of relational reasoning and cognitive models thereof. We review the current state of the art concerning the mechanisms of relational reasoning. This type of reasoning concerns the inference of interdependencies, such as in tasks as "Lea stands behind Tom. Rick stands in front of Tom." By inference, the conclusion "Lea stands behind Rick" can be derived. Theories of relational reasoning range from propositional-linguistic to mental model approaches and various subsequent implementations have been developed. Our aim is to review the current state of the art in cognitive models and architectures concerning relational reasoning to clarify in how far findings from cognitive neuroscience have been considered so far. Further, we review neurocognitive studies of relational reasoning and identify the functional brain regions crucially involved in the process of relational reasoning. We establish a comprehensible structure-function mapping which provides a guideline when biologically plausible cognitive modeling is aimed at.

33 ADAPT OR EXCHANGE: SUPPORTING DECISIONS IN MODULAR PLANTS WITH PROCESS RELATIONS OR CASES

Romy Müller, Technische Universität Dresden

Leon Urbas, Technische Universität Dresden

Abstract: Operators of modular plants have to decide how to achieve desired outcomes: by simply adapting process parameters or by exchanging modules? To investigate how people make such decisions, participants went through an instruction seminar and later performed a computer experiment. They learned about the causal relations between process parameters, the modules available, and factors to consider when making Adapt-or-Exchange decisions. In the experiment, they had to adjust a chemical process to increase conversion while avoiding foam. Four process parameters were related to one or both of these outcomes, and their available ranges varied between modules: Exchanging the current module for a bigger one provided more freedom in parameter settings, at a cost of time and effort. Six scenarios varied whether only adapting parameters without an exchange was safe, risky, or impossible. After each decision, participants had to implement it by setting their four parameters and physically reassembling a Lego plant in case of exchange. Two groups received different types of decision support: either line graphs that illustrated the relation between process parameters and targets, or cases that served as solution examples. The results revealed that the groups' performance was comparable in most measures, but when using relations participants interfered with the process much more. Most interestingly, there were pronounced variations in strategies, both between and within groups. These results provide first insights into the process of making Adapt-or-Exchange decisions and thereby provide a basis for systematically varying goal conflicts in forthcoming studies.

34   HOW BIAS-RESISTANT ARE MORAL PHILOSOPHERS?

Alex Wiegmann, Ruhr University Bochum

Joachim Horvath, Ruhr University Bochum

Abstract: Thought experiments figure prominently in philosophy, especially in moral philosophy. The intuitions we have about hypothetical moral scenarios are commonly treated as (defeasible) evidence and play an important role in developing and evaluating normative moral theories. However, the method of relying on case-based intuitions has received strong criticism based on empirical studies in experimental philosophy. Several studies found that moral intuitions can be influenced by factors that are apparently morally irrelevant, such as the order in which moral scenarios are presented. Based on such and similar findings, it has been argued that the method of cases is not reliable and its use in moral philosophy should be restricted. The so-called expertise defense is probably the most popular and promising reply to this challenge. It claims that findings of the described kind do not really pose a threat to the use of case-based intuitions because the respective studies exhibit an important limitation: Participants in these studies were lay people and, according to the expertise defense, it seems plausible to assume that experts' (i.e., professional moral philosophers') intuitions are largely immune to irrelevant factors. The expertise defense is an empirically testable hypothesis, but only a few studies on a rather narrow range of irrelevant factors have been conducted so far. We aim to advance the debate by presenting six cases involving robust and successfully replicated biases to expert moral philosophers and lay people, in order to compare to what extent both groups are influenced by these morally irrelevant factors.

35 INFERRING SUBJECTIVE BELIEF FORMATION FROM SMALL SAMPLES IN SEQUENTIAL HUMAN DECISION MAKING UNDER CONSCIOUS UNCERTAINTY

Thomas Wiebringhaus, FOM University of Applied Sciences, Essen

Abstract: Human brains evaluate in complex, dynamic and uncertain information environments under resource-bounded restrictions and thus lack the abilities to regard all possible aspects of their decisions (Gershman et al. 2015; Gigerenzer 2002; Kahneman 2003). Many real world decisions are classified as risk, ambiguous, or comprise an incomplete state space, sometimes also called coarse contingency. There is a lack of experimental work to contribute to the decision-theoretic work in formal epistemology (Dekel, Lipman, & Rustichini,1998; Gilboa& Marinacci, 2016). When making decisions under uncertainty, people establish different decision strategies. El-Gamal & Grether (1995) showed in their experiments that subjects used Bayes's rule, ignored the prior (representativeness rule) or overweighed the prior (conservatism).

The presented work aims to empirically differentiate types and grades of uncertainty and to elucidate the formation of experimental prior beliefs by examining sequential decision behavior from very small samples.

Experiments were conducted with n=69 (40 female, mean age = 24.6)). The task was to infer the color distribution of 90 balls in an urn. Participants were told that a drawn small sample yielded the colors {black, white, black} and were asked to allocate 100€ (as degree of belief) to their guess of the next potential draw. In addition, qualitative analyses were accomplished with the question "please give a rational explanation for your guesses".

36   MORAL JUDGMENTS IN TROLLEY AND FOOTBRIDGE DILEMMAS: AN EYE TRACKING STUDY

Evgenia Hristova, New Bulgarian University, Sofia

Abstract: The Trolley dilemma presents a situation in which a runaway trolley will kill five people if not diverted on a side track by pulling a lever, thus killing one person. The Footbridge dilemma describes a similar situation with a runaway trolley that will kill five people unless a bystander is pushed from a footbridge in front of the trolley. When people are asked to judge the moral appropriateness of the suggested resolutions, most of them find the resolution permissible in the Trolley dilemma but not in the Footbridge dilemma. The goal of the present study is to investigate the dynamics of moral judgments by using eye-tracking recordings. As expected, there are more permissible moral judgments in the Trolley dilemma compared to the Footbridge dilemma. The eye-tracking data show that for the Trolley dilemma participants look longer at the 5 persons that are endangered and that could be saved than on the 1 person that is not endangered but could be sacrificed. As the difference is present when the scenario is read (before the question is presented), it seems that in the Trolley dilemma people pay more attention to the five endangered persons and this leads to more permissibility judgments. This gives support to the idea that the concern for saving the endangered people is one of the factors playing role in moral judgments.

37   QUANTUM MEASUREMENT EFFECTS IN DECISION MAKING

Charlotte Hohnemann, Ruhr-University Bochum

Devin M. Burns, Missouri University of Science & Technology

Qizi Zhang, Missouri University of Science and Technology

S. N. Balakrishnan, Missouri University of Science and Technology

Abstract: Human decision making is replete with context sensitivities. Two important types are order and measurement effects, which do not conform to classical probability theory, but are inherent to the nature of quantum models (Wang, Solloway, Shiffrin, & Busemeyer, 2014). Using an Step-by-Step procedure (SbS) where participants have to respond after every item, Trueblood and Busemeyer (2011) provided evidence that a quantum model explains recency effects in a jury trial task better than two classical probability models proposed by Hogarth and Einhorn (1992). White, Pothos, and Busemeyer (2014, 2017) investigated measurement effects in an affective task comparing the SbS condition to an End-of-Sequence condition (EoS) where only one response was provided after seeing all items. The authors found evidence that providing a response to the first of a pair of stimuli increases the effect of the second (a stronger recency effect). White, Barque-Duran, and Pothos (2015) interpret this as an abstraction process, whereby some information about the first stimulus is lost when participants respond to it. Comparing a SbS with an EoS condition, our study investigated these effects with a cognitive task where participants combined two opposing pieces of evidence. We found a stronger recency effect when participants had to provide intermediate responses (SbS). Model comparisons using AIC showed that the quantum model provided a better fit to the data that the classical models proposed by Hogarth and Einhorn. These findings replicate the effects of White et al. (2014), extend them to a new paradigm, and instantiate them with quantitative modeling.

38   Eye scan patterns in problem solving

Samantha Stranc, Carleton University, Ottawa

Abstract: Valuable insights into cognitive processes can be gained from analyzing students' attentional patterns as they solve problems. Attentional data can be gained from eye tracking tools. To date, focus has been placed on analyzing fixation patterns, for instance recording how long students examine particular problem components. We will instead examine *eye movement patterns* which, unlike traditional fixation measurements, capture attentional shifts over time. The context of our analysis will be problem solving activities in the presence of examples, under varying degrees of assistance. The purpose of this analysis is twofold: to determine if levels and types of assistance in the target instructional activities influence scan paths and to explore the applicability of the scan path analysis tool, MultiMatch, for data from learning studies.

39   Towards a Comprehensive Taxonomy of Study Goals of University Students – A Synthesis of existing Study Goal Classification Systems and New Data

Felix Weber, virtUOS, Osnabrück University

Sebastian Osada, virtUOS, Osnabrück University

Marie Sindermann, virtUOS, Osnabrück University

Tobias Thelen, virtUOS, Osnabrück University

Abstract: Study goals are an important building block for successful university studies. They are an essential foundation of self-organization and serve as an individual measure of study success. We give a brief overview about categories of student goals found in the literature. Based on study goals in natural language, which we have recently collected from German university students, we develop a two-leveled comprehensive study goal taxonomy with 7 super-categories and 28 sub-categories. The natural language study goals are assigned to the categories by six raters and inter-rater-reliability is calculated for each category. We find that the learning a foreign language, going abroad, completing studies in short time, achieving a degree have a high inter-rater-reliability and good grades, learning programming, communication and contact and practical experiences have a moderate inter-rater-reliability.

Finally, we discuss the relevance of the results and possible future practical applications and research objectives. Practical implications for the usage of our categories in a digital data-driven study assistant system are sketched.

40   A Paradigm to Investigate Speech-Gesture Integration in Patients with Schizophrenia – Implications for the Use in a Multimodal Training Intervention

Lydia Riedl, TNM & CMBB, Philipps-University, Marburg

Gebhard Sammer, Justus-Liebig-University, Gießen

Momoko Choudhury, TNM & CMBB, Philipps-University, Marburg

Annika Nonnemann, TNM & CMBB, Philipps-University, Marburg

Anne Sütterlin, TNM & CMBB, Philipps-University, Marburg

Benjamin Straube, TNM & CMBB, Philipps-University, Marburg

Abstract: Background: Dysfunctional social communication is one of the most stable characteristics in patients suffering from schizophrenia. Former studies (e.g., Straube et al. 2013; Straube et al. 2014) could show left inferior frontal gyrus (IFG) involvement for impaired processing of co-verbal gestures, especially in an abstract content, in patients with schizophrenia. Since social-communicative deficits might lead to persistent social isolation, we have developed a speech-gesture training intervention focusing directly on communication skills in patients with schizophrenia. Objective: To evaluate neural changes due to such a speech-gesture intervention, a suitable and reliable experimental paradigm is necessary. Methods: In this study, we assess the neural correlates of gesture type specific speech-gesture integration in ten patients with schizophrenia with an adapted paradigm for the integration of gestures in concrete and abstract sentence content. During an fMRI passive viewing task, videos of an actor were presented to the patients in two conditions of content (concrete/abstract) and in three different modality conditions (multimodal speech-gesture/speech only/gesture only). Results: First results show activation in predicted brain regions (IFG) in a whole brain analysis, indicating higher processing costs for integration of gestures in an abstract sentence context. Conclusion: These results propose that our paradigm might also be suitable to detect specific changes of neural activation in the predicted brain regions after a multimodal training program. Due to our promising preliminary results, we expect to be able to demonstrate the beneficial effect of a speech-gesture training intervention on neural levels with the described paradigm.

41   ACCOUNTING FOR CONTEXTUAL MODULATION IN ARABIC BY A BAYESIAN PRAGMATIC MODEL

Matthias Unterhuber, Department of Philosophy, Ruhr University Bochum, Bochum, Germany

Suaad AlHelou, Department of Philosophy, Ruhr University Bochum, Bochum, Germany

Markus Werning, Department of Philosophy, Ruhr University Bochum, Bochum, Germany

Abstract: In a recent paper, Werning, Unterhuber, and Wiedemann compare three quantitative models to explain the contextual modulation of a word's meaning and how it affects probabilistic predictions on the completion of a discourse and, to this end, differentiate between the contribution of relevance and semantic similarity in relation to context, supporting a Bayesian Pragmatics framework as the best model. However, this approach has so far only been tested in Western cultures using Indo-European languages, whereas the predicted phenomenon might differ dramatically for other cultures and language families. We, thus, aim to test whether their results generalize for a non-European language spoken in Non-Western cultures: Arabic. As in Werning, Unterhuber, and Wiedemann's study, the Bayesian Pragmatic framework turns out to best explain the data suggesting that the Bayesian model can account best for contextual modulation also in some non-Indo-European languages and non-Western cultures.

42   ACTION-THOUGHTS AND THE ORIGIN OF MEANING

Andrew Simsky, Center for Eastern Christian Studies, Leuven

Abstract: Most people believe that they think in terms of their native languages. In this report I will argue that, in fact, we think in terms of actions, with speech being just one type of action. Moreover, I will show how actions tend to form hierarchical language-like systems, of which language itself is just one example. Actions are elementary units of our activity, and they are as natural to the human brain as numeric data are to computers. Nevertheless, the role of actions as a foundation of thinking has not yet been fully appreciated. As such, I put forward the concept of action-thoughts, defined as actions taken together with all the mental processes that drive them. The acquisition of language can be modelled as a process of chaining action-thoughts together and thus forming representations of verbs. Many first-order concepts and categories are action-defined, such that their meanings can be derived from the goals of the actions related to them. Mental actions tend to aggregate into language-like structures with their own syntax. Chess players, for example, think in terms of moves in the same way that engineers think in terms of mathematical formulas, and programmers, in terms of algorithms. In cases such as these, verbal markers function as pointers referring to complex procedures grounded in shared knowledge. In closing, mental and physical professional activities are discussed in light of the concept of 'work civilization'.

43   IS THE MODIFIER EFFECT EXPLAINED BY RATIONAL REASONING?

Corinna Strößner, DCLPS, Heinrich-Heine University, Düsseldorf

Gerhard Schurz, DCLPS, Heinrich-Heine University, Düsseldorf

Abstract: The perceived likelihood of a prototypical property in a noun category is diminished if the noun is modified. For example, subjects judge "Feathered ravens is black" as less likely than "Ravens are black". This *modifier effect* was replicated many times but is still not fully understood. We investigated whether it accords to rational reasoning. If this was the case, the strength of the modifier effect should depend on the perceived relevance and likelihood of the modifier. In order to test this, we collected ratings for modified and unmodified sentences as well together with ratings of the modifier relevance and modifier likelihood. As expected, we were able to reproduce the modifier effect, but it turned out that the subject's relevance and likelihood ratings were barely correlated to the decrease the modifier caused in the likelihood ratings. This speaks against the thesis that rational reasoning explains the modifier effect. The decrease in likelihood ratings seems to stem from pragmatic influences with a high degree of individual variability. In accordance with the rules of cooperative communication, the subjects implicitly assume that the modifier is relevant. We suspect that this pragmatic assumption is an unconscious bias. Note, however, that rational reasoning still plays some role. The above-mentioned correlations were high when measured on the mean ratings. Averaging over individual (pragmatic) variations amplifies the influence of those components on which subjects agree, like known relevance, which leads to a wisdom of the crowd effect.

ABSTRACTS

POSTER SESSIONS – Tuesday

44 - 88

(numerical order)

44   CAUSAL ROLE OF SENORIMOTOR CORTICES IN WORD RECOGNITION FOLLOWING SENSORIMOTOR-ENRICHED VOCABULARY LEARNING

Brian Mathias, TU Dresden

Andrea Klingebeil, Max Planck Institute for Human Cognitive and Brain Sciences, Leipzig

Gesa Hartwigsen, Max Planck Institute for Human Cognitive and Brain Sciences, Leipzig

Leona Sureth, Max Planck Institute for Human Cognitive and Brain Sciences, Leipzig

Manuela Macedonia, Johannes Kepler University Linz

Katja M. Mayer, University of Munster

Katharina von Kriegstein, TU Dresden

Abstract: Learning a foreign language (L2) can be both effortful and time-consuming. Sensorimotor-enriched approaches to L2 vocabulary learning such as the performance of iconic gestures may better approximate sensorimotor native language (L1) learning and potentially facilitate L2 acquisition. We used the neurodisruptive effects of inhibitory transcranial magnetic stimulation (TMS) to investigate whether motor and somatosensory cortical responses causally contribute to the auditory translation of L2 vocabulary following multisensory L2 training. Twenty-two participants learned novel L2 words over 4 consecutive days in two conditions. In one condition, participants viewed and performed gestures as L2 words were auditorily-presented. In a control condition, participants viewed pictures as L2 words were auditorily-presented. Gestures and pictures were congruent with word meanings. Following training, participants underwent effective and sham TMS as they listened to the L2 words that they had learned and translated the words into L1. We targeted with bilateral TMS a region near the boundary of motor and somatosensory cortices. Responses in this region were previously found to correlate with the behavioral benefits of performing gestures during L2 vocabulary learning. As hypothesized, the application of TMS slowed the translation of L2 words that had been learned by performing gestures—but not pictures—compared to sham stimulation. This result suggests that gesture-based learning induced changes in L2 representations within motor and somatosensory cortices, which in turn facilitated the translation of L2 words. Specialized sensory and motor cortices may therefore play a causal role in remembering the meanings of L2 words following multisensory encoding.

45   Children's Ability of Spatial Thinking is Related to Observer Viewpoints in Iconic Co-Speech Gestures

Ulrich Mertens, Paderborn University

Stefan Kopp, Cluster of Excellence Cognitive Interaction Technology, University of Bielefeld

Friederike Kern, Bielefeld University

Olga Abramov, Bielefeld University

Katharine Rohlfing, Paderborn University

Abstract: In this study 33 German preschool children at the age of 4 years participated during an explanation task, a retelling task, and a standardized SON-IQ test which measures the spatial thinking abilities of children. Many studies linked iconic co-speech gestures with cognitive processes like spatial thinking (Lavergne und Kimura 1987; Morsella und Krauss 2004; Rauscher et al. 2016; Rauscher, Krauss, & Chen, 2016) but no study distinguished between different viewpoints when considering iconic gesturing. We examined children's viewpoint (character viewpoint and observer viewpoint) in iconic co-speech gestures from the communicative tasks and related it to children spatial thinking abilities. For the communicative genre 'explanation', we found that the use of O-VPTs correlates significantly with children's spatial thinking abilities (r= .609; p= .001; n= 25). For the communicative genre 'retelling', we found that the spatial abilities are higher for the group using O-VPT (M= 110.56; SD= 12.066) than for children who did not (M= 98.69; SD= 15.892). This effect was significant (Z= -2.153; r= .375; p= .032). Facing our results, we can conclude that spatial thinking is not related to iconic gestures in general but deeply connected to O-VPT gestures. Therefore, our results reveal that individual differences in gesturing can be attributed to different cognitive abilities and that children's utilization of O-VPT gestures reflects their processing of spatial events (Wilson 2002; Shapiro 2014; Parrill 2010).

46 DIFFERENCES IN THE MENTAL REPRESENTATION OF VERBS IN GERMANS AND KOREANS: CATEGORIZING USING THE SEMANTIC DIFFERENTIAL

Min-Kyung Kim, University Bielefeld; Center of Excellence "Cognitive Interaction Technology" (CITEC)

Horst M. Müller, University Bielefeld; Center of Excellence "Cognitive Interaction Technology" (CITEC)

Sabine Weiss, University Bielefeld; Center of Excellence "Cognitive Interaction Technology" (CITEC)

Abstract: Meaning constitution during word processing and the inner structure of the mental lexicon are major issues in cognitive science. In the theory of grounded cognition it is assumed that sensorimotor mental simulations are involved in processing action verbs, leading to a final meaning constitution. However, it is still unclear whether the approx. 5.000 to 10.000 verbs of a language can be categorized by means of such cognitive features, and if this is possible, whether these features are comparable in different language families.

In this study, processing of verbs by German and Korean native speakers was examined in a rating study (semantic differential) to find some evidence for a specific categorization of German and Korean verbs based on their connotative meaning. To identify the semantic profiles, a cross-lingual study with 106 German and Korean participants was conducted. Each participant rated 40 verbs listed on a 7-step-scale by means of opposite adjective pairs leading to 83,200 data points.

Based on a cluster analysis and a factor analysis, we found that for Germans and Koreans different subcategories of verbs can be defined. Although most verb categories were comparable in German and Korean participants and thus partially cross-lingual, there also exist distinct categories (e.g., sensory/non-sensory). Interestingly, the most significant differences were found for abstract verbs, which particularly may depend on cultural differences. Thus, it is considered problematic to use a single verb classification system for the German and Korean language. This empirical data might contribute to determine the cross-linguistic cognitive reality of verb subcategories.

47   GENDER IS A FLEXIBLE CONCEPT: A COMPARISON OF ITALIAN AND DUTCH

Claudia Mazzuca, University of Bologna

Anna Borghi, Sapienza University, Rome; Institute of Cognitive Sciences and Technologies, CNR, Rome

Luisa Lugli, University of Bologna

Roberto Nicoletti, University of Bologna

Asifa Majid, University of York

Abstract: Conceptual flexibility is a pervasive phenomenon, embracing aspects related to linguistic and cultural diversity. Studies focusing on linguistic relativity, for example, demonstrate how concepts such as time, space and motion are affected by linguistic differences. Along the same lines, gender has been studied primarily in relation to grammatical structures; whereas philosophical debates have converged on the notion of gender as a social category. So, in addition to being a salient perceptual feature, gender seems to be a complex concept comprised of a multitude of facets. But what exactly do people think when thinking about gender? In this study we investigated the conceptualization of gender in two different linguistic and cultural groups, namely Italian and Dutch. In line with studies on conceptual flexibility we expected to find differences in the conceptual representation of gender. A second purpose of our study was to interrogate the abstract dimension of the concept of gender. According to recent perspectives abstract concepts can, in fact, have multiple sources of grounding, including both perceptual and cultural experiences. Overall, our findings show different linguistic groups stress differential aspects of gender. Dutch participants characterized gender as a more concrete concept, whereas Italian participants as more abstract. Taken together, our results question the traditional abstract-concrete dichotomy, as well as the sex-gender opposition. Gender can be considered a flexible and multifaceted concept with multiple sources of grounding retrieved depending also on the linguistic and social context.

48   GENERATION FREQUENCY OF WORDS IN DIFFERENT LEVELS OF SECOND LANGUAGE ACQUISITION

Olga P. Marchenko, Moscow State University of Psychology and Education

Abstract: The aim of this study to compare similarity (proximity) of category norms named in native (L1) and foreign language (L2) in different level of language competence. Our sample included a total of 80 undergraduate students (40 students with high level of L2 proficiency (M=20(1.9), 2 men) and 40 students with low level of L2 proficiency (M=20(1.2), 3 men). Participants were asked to list as many items belonging to a category as they could in 30 seconds. The frequency of each word in a category for Russian and English was calculated. In order to measure the similarity (proximity) of the frequency distributions for each category between Russian and English, the Hellinger Affinity (HA) coefficients were used. The level of affinity between frequency distributions in native and foreign language was stronger in group with high level of second language proficiency in comparison to group with low level of proficiency. It shows that level of language acquisition is important in order to give person possibility to express him/herself. The level of affinity between frequency distributions in L2 named by students from high and low proficiency groups was stronger than the affinity of L1 and L2 frequency distributions. It shows the cultural specificity of the data. So, the degree of cross-cultural universality of generated categories, and the experience of the interaction with exemplars from these categories within different linguistic contexts, both affect performance in cross-language category fluency tasks.

49 IS LYING BOUND TO WHAT IS SAID? - EMPIRICALLY INVESTIGATING DECEPTIVE PRESUPPOSITIONS, IMPLICATURES, AND ACTIONS

Louisa Marie Reins, University of Göttingen

Alex Wiegmann, Ruhr University Bochum

Abstract: Philosophical definitions of lying often assume that for a person to lie, they need to explicitly state something they believe to be false. Recent findings, however, have challenged this assumption by showing that untruthful presuppositions and cases of untruthful implicatures, through which believed-false contents are only conveyed implicitly, are categorized as lies. As people do not seem to hold the definition outlined above, the aim of the present research was to investigate the factors people instead take into consideration when classifying (speech) acts as lies. We presented participants with different stories of an agent deceiving by the means of presuppositions, implicatures, or actions, and thus without explicitly stating something believed-false. Participants indicated the amount to which they thought each agent had lied, and their amount of agreement to a set of six statements investigating possible predictors of the lie ratings. Results from a pilot-study suggest that all deceptions investigated were seen as lies. Furthermore, lie judgments were highly correlated with how much the agents were thought to have committed themselves to the not explicitly-stated believed-false claim, by how contradictive it would be to try to cancel that claim, and by how hard it would be for the agents to talk themselves out of it ($r = .82 - .87$). Therefore, our study is the first to show that people deem it possible to lie by acting deceptively, and that the agent's commitment, the claims' cancellability, and the possibility to bluff-out of it, are factors people strongly consider when classifying lies.

50   MECHANISMS OF ADULT WORD LEARNING: HOW TEMPORAL CONGRUENCY AND OBJECT MODALITY AFFECT WORD LEARNING

Samuel H. Cosper, University of Osnabrück

Claudia Männel, University of Leipzig

Jutta L. Mueller, University of Osnabrück

Abstract: Recent research has shown that infants are capable of learning labels for auditory objects (e.g., thunder) in a similar way to which they learn labels for visual objects (e.g., bottle). In contrast, adults have a strong preference for the visual modality. This leads to the question of whether the modality of an object influences word learning in adulthood. Furthermore, does the timing of stimuli occurrence also play a role in the mapping of novel labels onto objects? The current set of four studies investigates the mechanisms of adult word learning in a 2x2 event-related brain potential (ERP) study modulating object modality and temporal congruency of object and label presentation. The four experiments consist of auditory object (environmental sounds)-auditory word (spoken word) stimuli presented with a 600 ms within-pair pause, visual object (pictures of novel objects)-auditory with a 600 ms within-pair pause, visual-auditory with a 500 ms overlap of stimuli presentation, and auditory-auditory with a 500 ms presentation overlap. Each experiment consisted of a training phase, with sets of consistently and inconsistently paired stimuli, and a testing phase, where consistently paired stimuli were presented in matching and violated conditions. While adult ERPs during the test phase showed for visual objects N400 effects for violated pairings regardless of temporal condition, ERPs did not yield any responses for violated auditory pairings. These results indicate that the mechanisms behind adult word learning are directly influenced by the modality of the object, while the temporal congruency does not affect learning within a given modality. Together the data suggest that word learning in adults is influenced in favor of their visual dominance and they are not as flexible in learning novel labels for objects as infants.

51   MODELLING PREDICTIONS AT THE SENTENCE-LEVEL

Maxime Corbeil, University of Quebec in Montreal

Abstract: Under the predictive assumption, the brain is actively adjusting to the kind of information it expects to process next and this helps speeding up the computation. Although many studies about prediction and language have been conducted, the exact role of predictive behaviour is still debated within the field. As of now, most studies are focussing on predictions at the word-level and very few have considered predictions above word-level even though it has already been measured empirically and have been discussed in discourse studies. Word-level and sentence-level predictions should be modelled differently because in one case the next upcoming word is derived using only information at word-level whereas in the other case, the word is predicted from a higher hierarchical representation. In this poster, I present the computational differences between these two levels of predictions and I explain the intricacies of representing the interactions between bottom-up and top-down influences with respect to compositionality issues. I present a new predictive Bayesian model that integrates an explicit sentence-like representation, I compare it with Rabovsky et al.'s connectionnist inspired model and Friston et al.'s predictive architecture, and I show that predictions involving sentence-level representation lead to different derivations from the ones involving only word-level representations. I also describe how this model of sentence-level anticipation would fit within current integrated forward models of language. This study is a first step in developing predictive models that could be able to take into account higher hierarchical cognitive level explicitly.

52 THE IMPLICATION OF WORKING MEMORY IN GESTURE/SPEECH INTEGRATION: VALIDATION STUDY OF ICONIC GESTURE VIDEOS AMONG FRENCH SPEAKERS

Kendra G. Kandana Arachchige, University of Mons

Isabelle Simoes Loureiro, University of Mons

Mandy Rossignol, University of Mons

Professor Laurent Lefebvre, University of Mons

Abstract: Gestures constitute an important part of nonverbal communication. Among them, iconic gestures occur during verbal conversation and typically convey information that is semantically and formally related to the simultaneous verbal utterance. Because past studies were conducted among English-speakers, a validation study was required to create a new database of video stimuli for French-speakers before conducting a French-based study. This validation study was required to ensure the congruent and incongruent nature of the pair of video and sound. Thirty-four different gestures were considered and assembled into 17 pairs in order to create the incongruent condition. Forthy-nine healthy, French-speaking participants (13 men; M_{age} = 23.7; SD = 2.7) were recruited. They were asked to judge the semantic congruency and incongruency of 102 ((17 videos x 2 gestures x 2 gender) + 34 videos for incongruent condition) videos on a 5-level Likert scale ranging from 1 (totally incongruent) to 5 (totally congruent). They were also asked to judge the voice in 34 recordings as belonging to either a man or a woman. After analysis, 16 pairs of videos were chosen, congruent pairs having been considered congruent by participants at an average of 4.45/5 and incongruent pairs considered incongruent at an average of 1.16/5. Furthermore, participants classified the gender of the voice recordings correctly in 100% of cases. These results allowed us to create a database with 256 different combinations of iconic gestures and sound ready to use in our main study.

53 UNDERSTANDING THE ROLE OF LINGUISTIC DISTRIBUTIONAL KNOWLEDGE IN COGNITION: A SYSTEMATIC COMPARISON OF TASKS, MODELS AND PARAMETERS

Cai Wingfield, Lancaster University

Louise Connell, Lancaster University

Abstract: Through exposure to natural langauge, humans learn patterns of linguistic distributional information which aid in cognitive tasks of varying conceptual complexity. Linguistic distributional models (LDMs), a type of computational model, learn representations of words from statistical patterns in large text corpora, and can predict semantic relationships from these representations.

Typical LDMs fall into three classes: *predict*, *count-vector* and *n-gram* models. Distributional semantics research, which often optimises for performance on tasks driven by *semantic similarity*, has tended to recommend predict models trained on the largest coprora. By contrast, cognitive psychology research frequently employs a broader range of cognitive tasks relying on complex conceptual relationships. Here, relatively simple context-counting models (e.g., n-gram and count vector models) have proven effective predictors, despite being discounted from contemporary distributional semantics research.

The present study comprises a systematic evaulation of LDMs from all families on a wide range of common cognitive psychology tasks involving conceptual relationships, which range from simple and similarity-based (e.g., synonym detection) to more complex, abstracted relationships (e.g., concrete/abstract semantic decision); and from those which measure semantic processing explicitly (e.g., similarity judgement) or implicitly (e.g., response time). Using Bayesian model comparisons, we make recommendations for the optimal LDM when modelling tasks with particular features.

Our results show that when modelling human conceptual processes, different tasks require different LDMs, and no one model, or even family of models, does well at all tasks, and that models optimised for peak performance in one domain may not excel elsewhere.

54 **WHEN WORDS ARE UPSIDE DOWN – SIGNATURES OF EMBODIED LANGUAGE COMPREHENSION IN YOUNG CHILDREN**

Anne Vogt, Humboldt University Berlin

Barbara Kaup, University of Tübingen

Carolin Dudschig, University of Tübingen

Abstract: According to embodied theories of language comprehension, experiential traces become associated to words. Upon understanding a word the corresponding sensorimotor traces are reactivated. Even though lots of research on embodied language processing exists with adults, little is known about its role in the developing mind. We addressed this issue by investigating children with a similar paradigm as previously used with adults. For adults, nouns with referents that typically occur in specific locations in vertical space ('sun'=up vs. 'mole'=down) automatically reactivate this location information (Lachmair et al., 2011). We investigated whether these language-space-associations exist in children who do not have year-long experiences of co-occurrences. We presented a colored circle on the screen and participants responded by pressing a button located above or below the resting position of their hand in response to the color (e. g. for blue → move up, for red → move down, conditions reversed between subjects). Before we showed the circle, a noun was presented auditorily over speakers with a referent typically occurring in upper or lower space.

We found that even young children (4;8 to 7;5 years) show language-space associations comparable to adults, indicated by slower response times in conditions with mismatch between word type (up vs. down) and movement direction compared to compatible pairings of word type and movement direction. These results give us a more comprehensive picture of the role of embodied language by showing that experiential traces are reactivated during comprehension way before adulthood in an automatic manner.

55   INHERITANCE INFERENCE FROM AN ECOLOGICAL PERSPECTIVE

Paul Thorn, HHU Düsseldorf

Gerhard Schurz, HHU Düsseldorf

Abstract: This paper presents results from a simulation-based study of inheritance inference. The study aims to ascertain which kinds of inheritance inferences are reliable, with attention to variations in reliability that are contingent upon the type of environment in which inferences are made. For example, the study addresses whether inheritance inference is reliable in the case of 'exceptional subclasses' (i.e., subclasses that are known to be atypical in some respect), and attends to variations in reliability that result from variations in the entropy level of the environment. A further goal of the study is to show that the reliability of inheritance inference depends crucially upon the criteria that are used in selecting the classes that serve as the basis for inheritance inference. One approach to inheritance inference proceeds by treating any atomic predicate as determining an admissible class. A second approach identifies classes with the cells of a partition (of a preselected size k) of the set of objects that satisfies the condition of maximizing the similarity of objects that are assigned to the same class. In addition to permitting more inferences, our study shows that the second approach results in inferences that are far more reliable. The difference in the performance of the two approaches is particularly great in the case of exceptional subclasses. When paired with the first approach, inheritance inference in the case of exceptional subclasses is horrendously unreliable. With the second approach, exceptionality generally results in no more than a small decrease in reliability.

56   Is Space Special? The Role of Spatial Information in Analogical Reasoning, Problem Solving, and Decision Making

Holger Schultheis, University of Bremen

Rasmus Wienemann, University of Bremen

Abstract: Previous research suggests that spatial information processing plays a special role in human cognition providing efficient special-purpose processing mechanisms that are recruited not only for the spatial but also for non-spatial domains. However, comparatively little is known about the extent to which people can flexibly employ their spatial processing capabilities: How easily (if at all) can humans bring their spatial capabilities to bear in novel (i.e., not socially established) non-spatial domains? How easily (if at all) can humans use and ignore spatial information in non-spatial problem solving? To what extent is spatial information chosen over non-spatial information in problem solving when both types of information are concurrently available? In this contribution, we present three experiments that shed further light on these and related questions. Our experiments indicate that humans can flexibly employ their spatial processing capabilities. When necessary (Exp 1) or advantageous (Exp 2) people draw on their spatial abilities. At the same time, spatial information not necessarily takes precedence over other information when spatial information is pari passu to non-spatial information (Exp 3) and spatial information can readily be ignored, if its consideration may be detrimental to task success (Exp 2).

57   REVISION OPERATOR SEMANTICS

Eric Raidl, University of Tübingen

Abstract: There are many logics containing a conditional connective >, including classical logic, modal logic with strict implication, normal and classical conditional logics, the conditional logic of dynamic semantics, intuitionistic logic, relevance logic, and Hype. Whereas some relations between these are known, others remain unexplained. What is the relation between relevance logic and classical conditional logic, or between logics in dynamic semantics and the latter two? This paper attempts to built such a bridge, by defining a semantics where each logical operator is defined based on a different revision operator, plus an additional relation. The above logics are shown to arise from special cases, by tuning the semantic parameters. In particular, the paper will explore the different facets of Ramsey tests arising from these different logics.

58   THE ROLE OF EFFECT AND SAMPLE SIZE IN CAUSAL INDUCTION

Simon Stephan, University of Göttingen

Abstract: Because causal relationships are not perceivable they must be induced from the covariation between a potential cause and effect. Bayesian-inference models of causal learning use covariational information to infer the probability of a causal link between the target variables by incorporating two types of information: empirical effect (e.g., Delta-P) and sample size. Past studies revealed that reasoners struggle to recognize the role of sample size. We investigate why this is. For one, the cover stories used in previous studies emphasized the role of contingency and might thus have relegated the importance of sample size to the background. Another explanation is that reasoners fail to understand that sample size matters because it carries information about measurement reliability and thus about how compatible the data are with the absence of a causal link. We found that both explanations might be psychologically real. Using a novel paradigm in which participants themselves controlled sample size, we found that subjects who observed weak effects indeed preferred larger samples than subjects who observed strong effects. However, we also found that subjects who observed weak effects (1) did not increase sample size to an extent justifying strong inferences and (2) that they consequently refrained from doing so. Further, we found that this might be because subjects fail to see the connection between sample size and reliability. Presented with information about the sampling variation of a fictitious experiment, a large proportion of subjects concluded that the sampling variation would remain constant if sample size was increased.

59 **"IF YOU GESTURE I CAN'T FORGET WHAT YOU SAY": CO-SPEECH GESTURES OBSTRUCT INTENTIONAL FORGETTING**

Francesco Ianì, Turin University

Teresa Limata, Turin University

Abstract: Gestures favor memory for the speech they accompany. Such beneficial "enactment effect" relies on procedural learning that exploits the learner's motor system (Hilverman et al., 2018). In fact, prior studies have revealed that *producing gestures* strengthen the speech's memory traces to such an extent that it's hard to intentionally forget them (Sahakyan & Foster, 2009). Since former studies have revealed that during *gesture observation* the learner's motor system plays a pivotal role in creating strong procedural memory traces (Ianì & Bucciarelli, 2018), we hypothesized that also speech accompanied by a speaker's gestures, as compared to speech only, should be forgotten intentionally with greater difficulty. The task of the participants was to observe a series of videos of an actress uttering action phrases. Soon after each video, the participants were instructed either to remember or to forget the phrase just listened. At the end of the last video, the participants were invited to recall all the action phrases (Item directed forgetting paradigm; Bjork, 1970). Further, half of the participants watched the actress accompanying each phrase with a gesture and the other half watched the actress staying still (2x2 mixed-design: type of instruction x encoding method). A significant interaction reveals that the magnitude of the instruction's effect is greater in the no-gesture than in gesture condition, thereby suggesting that observed gestures convey speech-related procedural information which obstruct intentional forgetting.

60 Categorical Working Memory Representations in Jackdaws (*Corvus monedula*)

Aylin Klarer, Ruhr University Bochum, Germany

Jonas Rose, Ruhr University Bochum, Germany

Abstract: Working memory represents one crucial element of cognition. It is widely known that memory representations are noisy and become increasingly imprecise the longer the memory delay or the larger the number of items held in memory. It was shown for humans that by forming distinct color categories, memory of colors close to these categories becomes more precise and stable in comparison to colors in between. We trained two jackdaws, members of the corvid family that have advanced cognitive abilities and excellent vision, on a delayed matching to color paradigm. The birds had to report the exact shade of a color previously shown as sample from a color continuum. Depending on the accuracy of their response the birds received a graded reward (correct color and three neighboring colors on both sides were rewarded). Both jackdaws successfully perform this task, responding to a color within the range of ± 3 in approximately 38% of the trials. A clustering of responses around specific colors can be seen in the overall performance; however, differences in delay length do not lead to consistent effects on performance. The final paradigm will allow us to investigate the temporal retention of color information at different memory loads and variable memory delays. To examine the dynamics underlying working memory we will apply a dynamical systems model on our data, which was developed by Panichello et al (2018).

61   Examining the Cognitive and Metacognitive Mechanisms of Productive Failure in a non-STEM Learning Setting

Valentina Nachtigall, Ruhr-University Bochum

Nikol Rummel, Ruhr-University Bochum

Abstract: Several studies have demonstrated that Productive Failure (PF), a learning approach with problem solving prior to explicit instruction, is more effective for students' development of a deep understanding of a targeted learning concept than Direct Instruction (DI) with explicit instruction followed by problem solving. It is hypothesized that this effectiveness of PF is related to three (meta-)cognitive mechanisms: (1) students' activation of prior knowledge during initial problem solving, (2) students' awareness of knowledge gaps during subsequent instruction, and (3) students' recognition of the deep features of the targeted learning concept during instruction. Although it is assumed that the effect of PF does not depend on the learning domain, so far, the effectiveness of PF and the occurrence of the (meta-)cognitive mechanisms hypothesized to underlie the PF effect have only been replicated for learning in STEM domains. Thus, we have begun to examine whether the PF effect and its presumed (meta-)cognitive mechanisms evolve for student learning in a non-STEM domain. For this purpose, we conducted two quasi-experimental studies with 212 and 152 10th graders. We compared the effects of PF to the effects of DI on students' learning of social sciences research methods. Our findings demonstrate that although the mechanisms presumed to relate to the PF effect did evolve in our studies, the effectiveness of PF did not transfer to students' learning of social sciences research methods. Hence, there is a need to further examine the (meta-)cognitive mechanisms underlying the PF effect.

62 FAMILIARITY INTERFERES IN THE RECOGNITION AND NATURE OF THE MEMORIZED REPRESENTATION, NOT IN THE PROCESS OF RETRIEVAL

Isabella Wada Pucci, Universidade de São Paulo

Abstract: Our ability to save is greater for more familiar stimuli than for less familiar. However, the specific processes affected by familiarity are still less known. We investigate the familiarity effect on the retrieval of visual representations in a recognition task, using the retroactive cue paradigm. The origin of retrieval representations was investigated through the Dynamic Visual Noise (DVN). The familiarity, defined as to the repeated exposure to the same stimuli set, was manipulated between two groups of participants (N = 32). In each group, the type of cue (informative and neutral), type of test (positive, negative) and presence of RVD (absent, present) were manipulated between the tests. An experimental session was divided into three consecutive steps, each forming a block of evidence. An experimental task consists of a task of recognition with retroactive cue. The participant was instructed to memorize three Chinese characters, in the end of the interval, a retroactive cue would be able to inform him which stimuli is relevant to the task. Our results show that the performance of both groups improves throughout the experimental session, but more sharply at the group that worked with high familiarity stimuli. The retrieval process indep(e)nds of familiarity, however the more familiar representation is more susceptible to DVN, suggesting the repeated exposure to the same stimuli generates more stable representations.

63   Negative Mood Improves Verbal, but Not Visual Reasoning Task

Livia Valenti, University of São Paulo

Ricardo Garcia, University of São Paulo

Cesar Galera, University of São Paulo

Abstract: The negative mood may interfere with the retrieval of information from memory and with judgments making, resulting in poorly elaboration of strategies. In the present study, we investigated the influence of negative mood induction on a verbal and visual reasoning task. In the experiment 1A, the participants were divided into Negative Mood Group and Neutral Mood Group. Two mood inductions were presented. After each induction, the participants performed a verbal or visual task. The verbal task was an adaptation of Baddeley's Grammatical Reasoning Test. In the visual task, a sequence of two letters was presented in different orientations. The participant judged whether the set of individually presented letters was normal or mirror-imaged while keeping track of the orientation of each individual letter. In the experiment 1B, the participants performed the same methodologic procedure of 1A, with the addition of a visual span task performed before the experiment. The span task determined the number of letters that would be presented in the visual task for each participant. The results showed that the participants were induced to a negative mood, but there was a non-significant difference in accuracy between groups. An additional analysis of only the verbal reasoning task for the participants of both Experiments showed that the negative mood group performed better than the neutral mood group. Our results suggest that the induced negative mood improved the performance of participants in the verbal task. The negative mood would influence the cognitive process, reduce judgmental error and improve memory.

64   RUNNING DURING ENCODING IMPROVES WORD LEARNING FOR CHILDREN

Gianluca Amico, Institute of Sport Sciences, Saarbrücken

Sabine Schäfer, Institute of Sport Sciences, Saarbrücken

Abstract: The learning of new information is an important task in everyday life, especially at a young age. Acute physical exercise can facilitate cognitive processes in multiple ways (see a meta-analysis by Chang, Labban, Gapin & Etnier, 2012 and a review by Tomporowski, Davis, Miller & Naglieri, 2008). Previous studies have shown that memory can profit from physical exercise before (Coles & Tomporowski, 2008) and during the encoding of vocabulary (Schmidt-Kassow et al., 2010, 2013, 2014). The current study further investigates this interplay of movement and vocabulary learning and also addresses lifespan differences in these effects. Participants were recruited in a recreational basketball club. Children (N = 24, M_{age}= 12,3 years; 13 girls), young adults (N = 30, M_{age}= 21,5 years; 17 women), and older adults (N = 24, M_{age}= 59,3 years; 9 women) learned twenty new pseudo-words, which corresponded to a German word. In a between-subjects design, encoding took place either while standing, while running, or while running and dribbling a basketball. Recall was assessed throughout the learning session and on the following day. In children, more words could be remembered in the running condition compared to the standing condition. There were no differences between conditions for the young and older adults. Age dependent reasons for this pattern of results are further discussed and embedded into the literature of physical exercise. This result suggests that implementing learning activities into children's physical education or exercise activities could be beneficial.

65   APPLYING FALSE BELIEF ASCRIPTION WHEN IT REALLY MATTERS: CHILDREN'S FAILURE TO INCLUDE FALSE BELIEFS WHEN ASCRIBING INTENTIONS

Britta Schünemann, University of Göttingen

Marina Proft, University of Göttingen

Hannes Rakoczy, University of Göttingen

Abstract: Intentions are the subjective reasons for why people act (Astington, 2001). Hence, making sense of others' actions relies fundamentally on a fully-fledged concept of intentions: One has to appreciate that acting intentionally requires not only the desire for a certain outcome, but also the belief that the planned action will indeed achieve this desired outcome (Perner, 1988). While the ontogenetic development of the desire-component has been investigated extensively (Baird & Astington, 2005), research has neglected the crucial belief-component of intentions. Consequently, to certainly know when children's concept of intentions is fully developed, research is necessary on children's ability to appreciate that the outcome of an action, which is based on a false belief, is not intended. To this aim, we compared children's performance on structurally similar belief and intention test questions regarding analogous scenarios in which the protagonist acts on false beliefs. We found that even 7-year-old children but not adults fail to consider an agent's belief when ascribing intentions. An interesting pattern of correlations suggests that although a fully developed understanding of beliefs is necessary for the appreciation of the epistemic aspect of intentions, it is not sufficient. To investigate whether these difficulties reflect a genuine incompetence or originate from inferential demands, we run a subsequent study in which we substantially reduce inferential demands by ensuring children's awareness of the agent's false belief when they judge her intention.

66   MORAL JUDGMENTS ABOUT DILEMMAS IN THE CONTEXT OF WAR

Juan Carlos Marulanda Hernández, Georg August Universität Göttingen

Alex Wiegmann, Georg August Universität Göttingen

Michael R. Waldmann, Georg August Universität Göttingen

Abstract: In Ithe last few decades, moral psychologists have explored people´s moral judgments about dilemma situations in which doing something good involves causing harm. An often investigated example is the trolley problem in which saving a group of people from being run over can only be accomplished if fewer people are harmed. Traditionally, these kinds of dilemmas have been part of the philosophical debate between deontologists and consequentialists about whether the moral status of an act depends solely on its consequences or also on features of the act itself, such as its causal status and the violation of certain rights. Some authors have appealed to the doctrine of double effect (DDE) as a way to justify causing harms in certain situation within the framework of a deontological view. The DDE states that it is permissible to cause harm as a merely foreseen side-effect of an action aimed at achieving a greater good, although harming a person would be impermissible if it is intended as a means to achieve the same end. Empirical evidence has shown that the patterns of judgment of lay people are consistent with the DDE. The DDE has been often invoked in the theoretical discussion about ethics of war, in particular, to justify the involuntary killing of civilians during military operations where it is too costly or difficult to guarantee their immunity. Despite an extensive theoretical debate on the subject, little experimental research has so far been done on whether people's moral intuitions about dilemmas arising in warfare are sensitive to the means∕side-effect distinction. Furthermore, we were interested in investigating whether the moral distinction between killing as a means versus a side effect, which is well established for dilemmas arising in peace times, is also invoked in war. We hypothesized that this distinction is also morally relevant when civilians are the victims but suspected that it is less relevant for combatants. Combatants commit themselves to being harmed so that it should be less relevant how they are harmed. To empirically test our hypotheses, we have conducted three experiments on hypothetical war dilemmas inspired by the methodology of the trolley problem. Participants were presented with different scenarios in which they had to assess the moral permissibility of saving a larger group of people through

an act that kills a smaller group, either as a means or as a side effect. Across the different scenarios, the group of victims was made up of soldiers, farmers, or children. Our general finding is that in times of war people judge the damage caused to civilians as a means to achieve a good end as less permissible than the damage caused as a foreseen side effect. However, when the possible victims were combatants, moral judgments were less sensitive to the distinction between means and side effects. In these cases, participants focused more on the outcomes that on the causal setup.

67   PRAGMATIC EFFECTS IN ADULTS' FALSE BELIEF EVALUATION

Rachel Dudley, Ecole normale superieure, Paris

Salvador Mascarenhas, Ecole Normale Supérieure, Paris

Abstract: We examine traditional false belief (FB) tasks within the Theory of Mind (ToM) literature and ask whether pragmatic processes contribute to children's typical errors in these tasks. We test adults (a population which is known to have a full ToM) in a FB task and ask if pragmatic factors impact their rate of reality-based performance errors. We investigate three factors: (i) relevance of beliefs within linguistic stimuli, (ii) relevance of beliefs to the experimental context, and (iii) participant biases about what is relevant. We find evidence that linguistic stimuli and participant biases both lead adults to make reality-based errors in these tasks. These findings suggest that errors in childhood should be analyzed as performance errors instead of true competence errors, consistent with findings which suggest the early emergence of ToM.

68   SELF-KNOWLEDGE AS A RESULT OF THE RMBODIED AND SOCIAL COGNITION

Anita Pacholik-Żuromska, Nicolaus Copernicus University, Toruń

Abstract: Self-knowledge is understood as subject's knowledge about her own mental states. As such it needs to deal with the problem of the false self-representations which make the self-knowledge unreliable. I argue that the way of dealing with this problem is an externalistic account of self-knowledge, where its essential constituent is subject's interaction with her social environment.

69   SOCIAL COGNITION AND UNCANNY VALLEY

Emre Yorgancıgil, Yeditepe University, Istanbul

Hakan Atalay, Yeditepe University, Istanbul

Abstract: Masahito Mori's "Uncanny Valley Hypothesis" suggests that humanoid objects which materialize virtually, but not exactly like real human beings elicit uncanny feelings of eeriness and revulsion in observers. He used a hypothetical curve to describe this relationship, and indicated a sharp dip in this curve at almost humanlike levels as an uncanny valley (Mori, 1970). As humans percept this uncanny valley effect from humanlike robots, animations and computer games, more questions will be delivered. Can we create better designs of robot and animations to be perceived more humanlike? Why is human a unique living creature and robots are not? For the answer of these questions, we have to focus on the fundamentals of human psychology again because it seems that increase in our knowledge about this phenomenon will not only help us better explain some contemporary debates such as the social cognition or theory of mind, and so forth, but it will provide us with an important tool for investigating these not yet clarified psychological issues. Most of the hypotheses proposed to explain the uncanny valley phenomenon appear to suggest that it is the result of a dual cognitive process, the one that occurs early in information processing operations such as expecting or predicting what is perceived and the other later in higher cognitive processing phase such as further evaluation of what it is. It is necessary to use a multidisciplinary approach including psychodynamic and social as well as cognitive psychological theories to better understand such an "uncanny" subject.

70   PROCESS PHILOSOPHICAL CONSIDERATIONS OF HUMAN COGNITION AND ARTIFICIAL INTELLIGENCE

Domenico Schneider, TU Braunschweig

Abstract: In my article, I develop process philosophical approach of human brain activity and artificial intelligence. Furthermore, I show the crucial differences between these two types of cognition with the help of consideration of neural processes vs. digitized processes. To understand the whole problems of (i) human consciousness, (ii) artificial intelligence and (iii) digital development in human-computer and human-robot interaction it is important to look at the processes itself and not only at the content of any entity (content of language content of acting, content of computer program sequence, content of human-computer interaction). In my paper, I develop a process philosophical perspective for the whole problem.

71 WHEN DO WE ATTRIBUTE MENTAL STATES TO OTHERS AND ONESELF ADEQUATELY?

Adrianna Smurzyńska, Jagiellonian University, Cracow

Abstract: In my article, I develop process philosophical approach of human brain activity and artificial intelligence. Furthermore, I show the crucial differences between these two types of cognition with the help of consideration of neural processes vs. digitized processes. To understand the whole problems of (i) human consciousness, (ii) artificial intelligence and (iii) digital development in human-computer and human-robot interaction it is important to look at the processes itself and not only at the content of any entity (content of language content of acting, content of computer program sequence, content of human-computer interaction). In my paper, I develop a process philosophical perspective for the whole problem.

72 'ESSENCE' IS THEREFORE AN INTUITION

Kiran Pala, University of the Basque Country, San Sebastian

Abstract: Recent works on philosophy of mind and cognition have seen an increase of interest in theories of knowledge sources and its nature in offering an advancement of form of intuition is an object-giving source within in. The standard view holds that intuitions can be exhaustively accounted for in terms of their sensory or hyletic contents. However, a view of synthesis of intuitions proposed by Husserlian framework, specifies intuitions required a passive and temporal synthesis, in terms of content, mode, and object. This view is also suggested to hold for states of direct knowledge. This work primarily develops on the basis of Husserl's phenomenological work, I argue that a focus on historicity of how forms are objects of intuitions at the level of object constitution in knowledge is phenomenologically implausible. The final part offers essence transformation that become enriched in connection with act of knowing.

73   FROM A COGNITIVE PHILOSOPHICAL POINT OF VIEW

Andreas Stephens, Lund University

Maximilian K. Roszko, Lund University

Trond A. Tjøstheim, Lund University

Abstract: Central philosophical debates in, for example, epistemology, philosophy of mind, and philosophy of science, involve phenomena that are grounded in the minds and brains of cognitive agents. Accordingly, these debates ought to be elucidated by models from sciences such as cognitive neuroscience, cognitive ethology, and cognitive psychology. By analysing how agents interpret, represent, and conceptualize the world and themselves via their limited cognitive and neurological capacities, it is possible to show how philosophical investigations are constrained by cognitive limitations and evolutionarily directed interests. A dynamical cognitive philosophical approach can, arguably, help dissolve old philosophical problems and paradoxes, while at the same time provide novel input, interdisciplinary coherence, and overarching understanding to both philosophy and the sciences.

74   Human Visual Consciousness, Representations, and Actions

Mikhail A. Sushchin, The Center of Scientific Information Studies in Science, Education and Technologies, The Institute of Scientific Information for Social Sciences of the Russian Academy of Sciences

Abstract: In past decades, the problem of the character of human visual consciousness in light of multiple objective limitations of visual mechanisms has attracted attention of philosophers and cognitive scientists. A number of approaches have been put forth with the aim to resolve this puzzle, including the so-called grand illusion hypothesis, a sensorimotor account of vision and visual consciousness by J. K. O'Regan and A. Noë, and, more recently, the conception of visual ensembles. We maintain that the impression of a rich and stable visual world, that subjects typically have, stems from three major sources, namely (1) exploratory bodily activity, (2) immediate conscious visual representations, and (3) the impression of the presence of hidden parts of perceived objects and scenes (amodal perception). Our claim is that it is impossible to understand the nature of human visual consciousness without explaining these three essential aspects of the problem. The only theory that explicitly addresses all three aspects of the problem is the sensorimotor account of vision and visual consciousness by O'Regan and Noë. However, O'Regan and Noë's account rests on a very strong premise that subjects do not form visual representations during perception, which finds little support in experimental studies. Thus, we suppose that all three aspects of the problem should be addressed within the representational perspective, i.e., the perspective which does not embrace the world as its own model hypothesis. Finally, we hypothesize that recent Bayesian models of perception can significantly advance our understanding of the phenomenon of amodal perception.

75   SENSORY MODELS. RETHINKING REPRESENTATIONAL STATUS

Adrian Wieczorek, LMU Munich

Abstract: The aim of this paper is to rethink the representational status of behavior-guiding states in animals including humans. It examines the constitutive conditions which are to obtain for mental representation to be realized in its basic form. It tackles the question what is needed for an animal if is not merely to react to, but acquires a depicting perspective on its environment, specifying how things are. Given the crucial role of the concepts of "mental representation" and "intentionality" in philosophy and cognitive science, this "status-question" of the representing mind deserves to be reconsidered.

My purpose is to show firstly (1) that the question has not been sufficiently answered by the two most prominent theories, Cognitivism and Teleosemantics. They fail to fulfill two principles which I propose to be implemented if basic and genuine mental representation is to obtain. The first principle I call the "emancipation principle". It requires of basic representation to evolve from receptivity, i.e. from functional correlation or co-variation, but neither "decouple" itself from it nor is reduced to it. The second principle, the "autonomy principle", says that first forms of representation neither presuppose high-level representations such as inference, tacit knowledge or representation of representations nor depends merely on a projection of informational content by an observer.

Secondly (2), I propose to reevaluate two promising strands of thought which in the literature, however, were falsely treated as individually sufficient: "decouplability" and mental models or "s-representations". Therefore, I sketch a reformulation and combination of them to propose a variant of embedded representation. If both are interwoven, an animal's depicting perspective on its environment is realized in a sensory-emancipated and autonomous manner.

76   THE BLIND VARIATION AND SELECTIVE RETENTION (BVSR) THEORY AND THE LANGUAGE OF THOUGHT

Pauli Laine, University of Jyväskylä

Abstract: Cognition has evolved to support survival and reproduction. All animals with central nervous system have some kind of language of thought (Fodor, 1975) to enable their flexible behavior, decision making, and problem solving. In humans, external language has expanded this internal language of thought to unparalleled levels on our planet. In this paper, I present a model of language of thought based on the blind variation and selective retention (BVSR) theory (Campbell, 1960). BVSR involves both controlled and spontaneous cognitive processes to explain creative thinking. It has also interesting connections to Fodor's language of thought theory, if we assume that "a set of behavioral options" is created spontaneously. This model can even be tested with brain imaging techniques. My research group has done measurements with magnetoencephalography (MEG) in Jyväskylä Center for Interdisciplinary Brain Research (CIBR) for subjects performing some linguistic and visual creativity tasks in order to locate their potential common neural correlates. I will present some preliminary results of these measurements and how they could support this model, i.e. BVSR theory, and its connection to language of thought theory.

77   **THE DISCRETE FORM OF CONSCIOUSNESS AND THE ILLUSION OF CONTINUITY: AN FMRI CASE STUDY ON MUSIC IMAGERY AS A ROADMAP**

Morteza Izadifar, LMU , Munich

Abstract: Apart from the main challenging issues about how consciousness arises, there still exists the opacity between consciousness flow and its relationship to time. How does consciousness emerge in the course of time? Does the brain do it in a smooth, non-stop and continuous form (As James believed) or the perception is a sequence of discrete consciousness instants? If we take the discrete form of consciousness as a fundamental hypothesis, then we should answer another question: How are these discrete forms connected together? What is the brain mechanism behind it? In pursuing these answers, we have done an fMRI experiment: Can we find some clues about neural correlates of consciousness by pursuing imagery? Does mental imagery equal to conscious perception? In this experiment, we have investigated auditory imagery as a roadmap in understanding the underlying brain mechanism behind the flow of consciousness. We implemented an fMRI experiment on a musician in two different forms of auditory imagery: continuous and interrupted. What we noticed is that the brain uses a completely different mechanism while it is in a very continuous form in comparison to when it encounters with pauses. We saw a significant stimulation in visual cortex during non-pause condition. We hypothesized that it could be the case that our visual system fills the gap of the discrete form of consciousness and it plays an important role in the illusion of continuity of perception. Our finding can fortify this idea that the primary visual cortex plays a vital role as the source of all inputs and thus is the core and necessary logistic function for conscious perception.

78   THE NATURAL EGO-CENTER: AN EXPERIMENTAL ACCOUNT TO LOCATE THE INNER SELF

Sarah Schäfer, University of Trier

Dirk Wentura, Saarland University, Saarbrücken

Marcel Pauly, University of Trier

Christian Frings, University of Trier

Abstract: A rich body of research suggests that people have an understanding of what they consider their 'Self' and where it is located, namely near the head and upper torso. However, previous interpretations are based on subjective ratings as participants were asked to locate their self. Here we offer an account to assess whether the presumed location of the self near the head and upper torso can be confirmed with an objective measure. Therefore we used a paradigm, in which formerly neutral stimuli are associated either with the self or with a non-self-relevant other. A resulting prioritization of the newly self-associated stimuli is interpreted in terms of an integration of the stimuli into the self. We assessed whether stimuli will only be prioritized when presented within a close distance to the hypothesized location of the self, that is close to the head or torso. Indeed, there was a significant prioritization effect when the to-be-associated stimuli were presented close to the head and upper torso, whereas this prioritization effect was significantly reduced and even vanished when the stimuli were presented further away from this area. Thus, only when the stimuli were perceived as close to the self, they were integrated and prioritized, but not when the stimuli were perceived as far away from the self. The results reveal an influence of the area about the head and upper torso for self-prioritization and thereby suggest an implicit location of the self in this area, which does not depend on external believes.

79 A Cognitive Model for the Takeover Task in Complex Environments for Highly Automated Driving

Nele Rußwinkel, TU Berlin

Marlene Scharfe, TU Berlin

Abstract: Highly automated driving (HAD) is developing rapidly. Still the driver will play an important role in future HAD functions. Especially the takeover of the driving task when the system reaches its limits is important. As the human has to interact with technology, it is important to focus on the human and the interaction with the machine. Especially human cognitions during the takeover are necessary to address, as they give a lot of insight concerning the development of takeover mechanisms. In this paper, a cognitive model was established, that represents human cognition during a takeover situation.

80   Curiosity-Based Exploration in the Proprioceptive Space of a Humanoid Robot

Yasmin Kim Georgie, HU Berlin

Guido Schillaci, HU Berlin

Verena V. Hafner, HU Berlin

Abstract: The first senses to emerge in the foetus are the proprioceptive and somatosensory senses. In early developmental stages, fetuses begin to perform self-exploration, through which contingencies between actions and sensations are acquired. This learning of sensorimotor contingencies both drives and is rendered through interactions between brain-body-environment. Researchers have hypothesized that this process is driven and progressively refined by the reduction of the prediction error between predicted sensory outcomes and motor actions.

We present a proprioceptive model in the humanoid robot Pepper, which involves predictive inverse and forward models that are trained in an online and unsupervised fashion. The interplay between these models gives rise to exploration behaviours. This work addresses the following questions:

- Can observable patterns of behaviour emerge as a result of prediction error minimisation in the exploration of the proprioceptive space?

- How would these patterns change as a result of integrating exteroceptive modalities?

We model proprioception by using the information about the robot's joint angles and electric current in the joint motor. We expect the models to produce specific patterns of behaviour, which are dependent on the contingencies between certain motor actions and the target electrical currents as the model tries to minimise a prediction error. Curiosity-based exploration is implemented by selecting target electric currents that are expected to maximise learning progress.

81   TOWARDS IDENTIFYING IMPORTANT RESEARCH TOPICS: A PRIORITISATION FRAMEWORK TO COGNITIVE SCIENCE

Shiva Pauer, Universität Hamburg

Max Räuker, Technische Universität Darmstadt

Sebastian Achter, Technische Universität Hamburg

Nathan Bowler, Universität Hamburg

Abstract: How can cognitive scientists identify research topics that contribute most to the flourishing of humanity? Based on the assumption that research is most consequential if addressing large-scale problems that are neglected but solvable, we argue that prioritization criteria allow to quantify and prioritise research topics regarding their potential impacts. Applying the criteria to cognitive science examples related to artificial intelligence, decision-making, and sentence processing, we demonstrate the relevance of prioritisation research and point toward open questions for future research. We hope our account provides a useful decision-support tool to guide research activities, and follow-up prioritisation research may apply our account for empirical investigation of the relevance of cognitive science research topics.

82   Affordances and Ill-defined Problem Solving: A Perspective from Situated Cognition

Pankaj Singh, Indian Institute of Technology Kanpur

A.V. Ravishankar Sarma, Indian Institute of Technology Kanpur

Abstract: The framework of information processing theory of problem solving confined the problem solving to the working of the brain processes. Their model was successful in explaining the problems which were self-contained, well-defined, and knowledge lean. But, the cracks in neat picture of information theory problem solving started to appear when researchers tried extend the theory based on well-defined problems to explain real world problems which are mostly ill-defined in nature. Most of the real world problems which humans encounter do not have clear definition of the problem, or do not have clear goal state and predefined means to reach the goal state. We argue that failure of information processing theory of problem solving to address the ill-defined problems in their framework is related with the nature of ill-defined problems being dynamic in nature. Dynamicity in ill-defined problems indicate towards involvement of activity based agent-environment interaction in real world problems. We argue that due to dynamic nature of ill-defined problems information processing theory framework of problem solving is not suited to explain the mechanism of ill-defined problems. We propose that framework of situated cognition is a better fit to address the mechanism of ill-defined problems. Within the situated cognition framework, our focus is on the concept of "affordances", which is often conceptualized as possibilities for action in an environment. We have further argued in the paper that conceptualizing problem solving with the help of affordances indicate towards embodied, embedded, enactive, extended, and situated aspect of cognition.

83 CAN VALENCE-VERTICALITY METAPHOR INCONGRUENCE FACILITATE PEOPLE'S MEMORY?

Zixi Jin, Cardiff University

Ulrich von Hecker, Cardiff University

Abstract: This series of experiments intends to explore whether metaphor-incongruence can provide stimuli with advantages for memorising, and under what circumstances such incongruence is likely to be salient. Experiment 1 & 2 used positive and negative words as memory stimuli presented at up or down locations. The results revealed that negativity and metaphor-incongruence had an effect on memorising performance, so that the combined effect contributed to the best recall performance for negative words presented at the up location in the metaphor-incongruent group compared to positive words at down location in the same group, as well as compared to words presented up or down in the metaphor-congruent group. Experiment 3 was planned to test recognition memory with the same stimuli and to see if the same effect still existed. Experiment 3 also introduced multinomial processing tree model (MPT) analysis in order to show item memory, source memory and guessing biases separately so that the metaphor effects can be associated more clearly with particular cognitive stages. Experiment 3 is still in data collection phase. Experiment 4 & 5 are in the planning stage which are both replications of Experiment 3 but with neutral words and face expressions respectively as memory stimuli, so that the comparison of the results can show whether the effect can influence the memory of different kinds of stimuli in the same way. For future research, we will strive to explore the mechanisms underlying this effect, with a view of finding suitable applications for it in daily life.

84   INFLUENCE OF PERSPECTIVE ON THE SPATIAL INTERPRETATION OF POINTING GESTURES

Lisa-Marie Krause, University of Würzburg

Oliver Herbort, University of Würzburg

Abstract: Pointing gestures are one of the main pillars of human communication. However, observers often fail in interpreting these gestures correctly. Former studies suggest a decisive influence of the observer's perspective leading to systematic biases. To investigate these biases, we asked participants to guess where a virtual pointer was pointing in a VR environment and manipulated the observer's position, his height of view and the pointer's arm orientation. While changing the perspective from behind the pointer further to his right side the pointing gesture was perceived further left- and upward. The results show a large influence of observer's position and height of view on the perception of the pointer's arm. There was not one 'good' perspective that leads generally to greater accuracy in interpretation because it depends on the dimension (vertical or horizontal) on which the gestures were interpreted.

85   Sᴘᴀᴛɪᴀʟ Pʀᴏᴄᴇssᴇs ɪɴ Cᴀᴛᴇɢᴏʀʏ Assɪɢɴᴍᴇɴᴛ

Ulrich von Hecker, Cardiff University

Zixi Jin, Albert-Ludwigs-Universität Freiburg

Abstract: This research investigates the hypothesis that spatial processes are involved in judgments on membership in a category. It is argued that membership versus nonmembership of an object or a concept, in a category, is spatially simulated by a minimal continuum with two levels. With membership confirmed, the mental representation of the entity is mentally placed on the left side, and on the right side in case of nonmembership. In analogy to other embodied dimensions such as the time line or the number line, the orientation of membership levels on the mental dimension is assumed to follow the acquired reading/writing schema, with procedural primacy implying dominance, hence leftward positioning of dominant elements.

This rationale is tested in three experiments. In a recognition memory paradigm (modified 2AFC paradigm) we show that participants are faster indicating the location of an old word on the screen when displayed left within a pair of words, indicating a spatial representation of category membership ("member" = left, "nonmember" = right). For category discrimination we found faster and more accurate performance when a target word is presented left as compared to right. Finally, discriminating categories in a stimulus-response compatibility paradigm, participants were faster making correct responses with their left hand than with their right hand in target category trials. In contrast, no differences were found for distractor trials. Overall, this pattern of results across the three experiments provides evidence in support of a spatial simulation of category assignment.

86   THE PERSPECTIVE DETERMINES THE PRODUCTION AND PERCEPTION OF POINTING GESTURES

Oliver Herbort, Julius-Maximilians-Universität Würzburg

Lisa-Marie Krause, Julius-Maximilians-Universität Würzburg

Abstract: Pointing is a ubiquitous means of communication. Nevertheless, observers systematically misinterpret the location indicated by a pointer. We examined whether these misunderstandings result from the typically different viewpoints of pointers and observers. Participants either pointed themselves or interpreted points while assuming the pointer's or an observer's perspective in a VR environment. The perspective had a strong effect on the relationship between pointing gestures and referents. whereas the task had only a minor influence. Hence, the misunderstandings between pointers and observers primarily result from their typically different viewpoints.

87   LEARNING THERAPIST'S CONVERSATION SKILLS AND CHANGES IN HAND MOVEMENT ACTIVATION

Katharina C. H. Reinecke, DSHS Köln

Alina Kopec. DSHS Köln

Lukas Thönnißen, DSHS Köln

Hedda Lausberg, DSHS Köln

Abstract: Aim: Motivational Interviewing is a person-centered, cooperative conversational skill. To become a successful movement therapist, students assist an MI training based on role plays and experience-based learning. This study aims at identifying aspects of students' nonverbal behavior, that are sensitive to identifying successful conversational skills-trained movement therapists.

Method: 26 pre- and post-learning video recordings of role play sessions before (n = 13) and role play sessions after (n = 13) learning motivational interviewing were recorded. Two independent certified raters analyzed the video recordings with the nonverbal behavior analysis system NEUROGES-ELAN.

Results: Role play therapists displayed significantly longer activation than role play patients. After experience-based learning, role play therapists nonverbal behavior changed into shorter activation than before experience-based learning. After experience-based learning, role play therapists' activation became less activation in comparison to role play patients' activation.

Conclusion: The present results of this study show that experience-based learning effects can be detected in the role play actors' nonverbal behavior. Successfully acquired professional conversational skills are associated with shorter movement activation. An explanation could be, that role play therapists are hyperactive at the beginning. After learning the conversational skills, they act more receptively.

88   Looking out for Synchrony: Effects of Expertise and Experience on Visual Attention in Spectators Watching a Video Recording of William Forsythe's Choreography „Duo"

Bettina Bläsing[1,2] Stephan Ernst[2], Gaurav Kumar[2] & Elizabeth Waterhouse[3,4]

[1] TU Dortmund, Faculty of Rehabilitation Science, Department of Music and Movement in Rehabilitation and Therapy, Germany

[2] Bielefeld University, Center of Excellence Cognitive Interaction Technology (CITEC), Germany

[3] University of Bern, Switzerland

[4] Freie Universität Berlin, Germany

Abstract: The question how spectators with different levels of expertise and experience watch and perceive dance has recently gained a lot of attention and scientific interest (e.g., Bläsing et al., 2012; Bläsing, 2015). While eye movements provide detailed quantitative information about processes of visual attention, only few studies have used eye-tracking to investigate visual attention with regards to watching dance. Stevens et al. (2010) found that dance experts showed an enhanced speed of visual processing and ascribed this to experts' superior ability to anticipate the movement, aided by acquired schemata for body and movement configurations in long-term memory. Little is known so far about how spectators watch and perceive dancers moving together, and how this relates to their own expertise, experience and preference. In an eye-tracking study, participants watched a video recording of the dance piece "Duo" choreographed by William Forsythe, in which the two dancers Brigel Gjoka and Riley Watts are coordinating their movement on a high level of virtuosity without music or external beat, relying on entirely on their experience, breath scores and body sounds as cues for mutual entrainment (Waterhouse et al., 2014).

89   PERCEPTION – DISTANCE ESTIMATION OF TRAFFIC PARTICIPANTS

Julia Bastian, University of Lueneburg, Trier, Germany

Abstract: Many of the oldest questions in psychology deal with perception (Proffitt, 2006).

Moeller, Zoppke & Frings (2016) found underestimations in distances (4, 8, 12, 16 and 20 m) by pedestrians and drivers before and after driving or walking. In our study we took the car drivers and pedestrians and included cyclists. We added three more and farer distances (between 30 and 50 m), changed the indirect into a direct measurement and replicated the experiment with no equal intervals of distances. Similar to the findings of Moeller, Zoppke & Frings (2016) we found stronger distance underestimations in a driver condition than in the pedestrian condition. As Proffitt (2006) stated, nonvisual factors, such as people´s goals and physiological states influence their distance perception. According to the action-specific perception account, people perceive the environment in terms of their ability to act in it (Witt, 2011). Action ability is dynamic and thus, factors that influence ability will also influence perception.

The results can be described in the sense that pedestrians and cyclists have a more similar perception of actions concerning their physical effort and more similar distance estimation patterns.