

VIII Dubrovnik Conference on Cognitive Science  
DUBROVNIK, 28 APRIL - 1 MAY, 2016.

# Comparative Cognition

## from Ethology to Cognitive Science



### Invited Speakers:

Redouan Bshary, Irene Pepperberg, Josep Call,  
Tecumseh Fitch, Márta Gácsi, Anna Wilkinson

### Chairs:

Anna Kis, Attila Andics

### Organizers:

Csaba Pléh, Anna Kis, Attila Andics, Paula Fischer  
Anna Gergely, Nevena Padovan, Francesca Bonalumi

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



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CENTRAL EUROPEAN COGNITIVE SCIENCE ASSOCIATION

# Programme

## Thursday, April 28:

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**16:00-18:00** Registration

**18:00-19:00** Welcome Reception

## Friday, April 29:

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**09:00-10:00** Key note speaker: ***Anna Wilkinson***

**Cold-blooded cognition: Social cognition in reptiles**

**10:00-11:30** Coffee break and **Poster session I**

**11:30-11:45** Selected talk: ***Simone Pika / Marlen Fröhlich***

Cooperative communication and communication styles in the two Pan species: Are bonobos the better models for language evolution?

**11:45-12:00** Selected talk: ***Elizabeth (Bess) Price***

Combinative social learning scaffolds innovative tool-making in young children

**12:00-12:15** Selected talk: ***Ljerka Ostojic***

Behaviour-Reading versus Mentalising in Eurasian Jays

**12:15-12:30** Selected talk: ***Christian Nawroth***

Human-directed behaviour by goats during a problem-solving task

**12:30-13:30** Lunch

**13:30-14:30** Key note speaker: ***Josep Call***

**A taste of ape metaphysics**

**14:30-16:00** Coffee break and **Poster session II**

**16:00-17:00** Key note speaker: ***Márta Gácsi***

**The effect of social context on the decisions of our dogs**

**17:30-** Social program

## Saturday, April 30:

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**09:00-10:00** Key note speaker: ***Redouan Bshary***

**The social brain hypothesis applied to fishes**

**10:00-11:30** Coffee break and **Poster session III**

**11:30-11:45** Selected talk: ***Maria Elena Miletto Petrazzini***

Do fish (*Pterophyllum scalare*) and humans (*Homo sapiens*) apply similar numerical criteria in numerosity judgments?

**11:45-12:00** Selected talk: ***Matjaž Hegedič***

How many ravens does it take to preen one? A self- and social preening comparison

**12:00-12:15** Selected talk: ***Eszter Szabó***

Domestic chicks' expectations about the presence and the absence of an object

**12:15-12:30** Selected talk: ***Irene Torres***

Do Rats Recognize Non-Words by their Vowels or their Consonants?

**12:30-13:30** Lunch

**13:30-14:30** Key note speaker: ***Tecumseh Fitch***

**Bio-Linguistics: Studying Language Evolution with the Comparative Approach**

**14:30-16:00** Coffee break and **Poster session IV**

**16:00-17:00** Key note speaker: ***Irene Pepperberg***

**Cognitive and communicative abilities of Grey parrots**

**17:00-18:00** Committee meeting

**18:00-18:30** Farewell words

**20:30-** Social program

**Sunday, May 1:**

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Departing

## **Abstracts - Invited speakers**

### **COLD-BLOODED COGNITION: SOCIAL COGNITION IN REPTILES**

*Anna Wilkinson,  
University of Lincoln, UK*

Social Cognition in Reptiles Very little is known about the cognitive abilities of reptiles. They have traditionally been considered to be “sluggish and unintelligent creatures” (Yerkes 1901, p 520) and have largely been ignored in the study of animal cognition. However, more recent research has revealed an impressive suite of cognitive abilities. To gain an understanding of the evolution of cognition in amniotes, it is necessary to carry out direct experimental investigations of the learning and memory abilities of reptiles that parallel the extensive work already available in mammals and birds. Therefore, examination of the cognitive mechanisms underlying the behaviour of these animals can provide crucial information about the evolution of the brain. This is particularly relevant to questions relating to social cognition as their varying social structures allow us to test hypotheses which could not be investigated in mammals and birds. This talk will present some recent research on the cognitive abilities of reptiles and compare them to what is known about these processes in other animals.

## **A TASTE OF APE METAPHYSICS**

*Josep Call,*

*School of Psychology and Neuroscience, University of St Andrews, UK  
Max Planck Institute for Evolutionary Anthropology, Germany*

Cognition rests on various organizing principles governing the physical and social worlds. The spatial and temporal continuity of objects as well as their relations with other objects (and agents) play a crucial role in things like inference, problem solving, and communication. In this talk I will present several studies exploring how nonhuman apes conceive objects and their relations with other entities. More specifically, I will focus on how apes respond to spatial, numerical and feature transformations of the objects themselves and those other entities surrounding them.

## **SOCIAL CONTEXT HAS A SPECIAL EFFECT ON THE RESPONSES OF OUR DOGS**

*Márta Gácsi,  
MTA-ELTE Comparative Ethology Research Group, Hungary*

The role of dogs has changed in most societies, which has not gone unnoticed in the academic field; researchers started raising questions, which could not have been raised a decade ago, for example, about the empathy, guilty behaviour, personality, or emotion recognition in dogs. But when it comes to training, we seem to borrow the good old learning theory from psychologists and apply the rat models to our pets. While we keep in mind that the “behaviourist models” do not completely mirror the pretty complex learning processes of our dogs, this can be a plausible approach. However, considering the accumulating scientific data on dogs’ sensitivity to human social cues and their unique interspecific social learning skills, we should not forget about a natural kind of information acquiring in social species; learning from the behaviour of the group members without direct reward. I will discuss social learning of dogs from an ethological perspective and demonstrate some intriguing examples from experimental research.

## THE SOCIAL BRAIN HYPOTHESIS APPLIED TO FISHES

*Redouan Bshary,  
Université de Neuchâtel, Switzerland*

While at the origin of vertebrate diversification and equipped with smaller brains than mammals or birds, recent research suggests that fishes are suitable to test general hypotheses about vertebrate social cognition and its evolution: brain structure and physiology are rather conserved among vertebrates, and fish are able to perform complex decisions in social contexts. Fishes have been particularly useful using a more functional approach to falsify claims by economists and evolutionary anthropologists concerning factors that make human cooperation unique. Less research has been devoted to study the precise underlying cognitive processes. I will highlight some key results from our main study systems, which involve interspecific cooperative hunting associations and marine cleaning mutualism. The results generally support the ecological approach to cognition with its emphasis on function rather than on phylogenetic relatedness.

## **BIO-LINGUISTICS: STUDYING LANGUAGE EVOLUTION WITH THE COMPARATIVE APPROACH**

*Tecumseh Fitch,  
Université de Neuchâtel, Switzerland*

Language as a whole is unique to humans, but many components of language are nonetheless shared with other animals. I will attempt to demonstrate the value of a comparative approach by describing two case studies on speech and syntax. In speech, recent data indicate that a long-standing focus on vocal anatomy, and particularly the descended human larynx, has deflected attention away from more fundamental changes in the neural pathways involved in speech control. Regarding syntax, studies examining pattern perception in both auditory and visual domains suggest that some aspects of linguistic syntax rest on a cognitive basis that also applies to other human cognitive domains including music and visual pattern perception. Specifically, the strong human propensity to attribute complex, hierarchically-embedded structures to visual or auditory inputs, which I dub “dendrophilia,” appears to be biologically unusual or perhaps unique to our species. These two examples illustrate the power of comparative data to illuminate our understanding of the neural bases of language, and its evolution.

## **COGNITIVE AND COMMUNICATIVE ABILITIES OF GREY PARROTS**

*Irene Pepperberg,  
Harvard University, USA*

For almost 40 years, I have examined cognitive and communicative abilities of Grey parrots. We train the birds to communicate with us using the sounds of English speech, and then test them as one might test a human toddler. I discuss some of our more recent studies involving how these birds react to several common optical illusions, respond on tests of delayed gratification and Piagetian liquid conservation, and how they solve tasks involving probabilistic reasoning.

## Abstracts – Selected talks

### COOPERATIVE COMMUNICATION AND COMMUNICATION STYLES IN THE TWO PAN SPECIES: ARE BONOBOS THE BETTER MODELS FOR LANGUAGE EVOLUTION?

*Marlen Fröhlich, Max Planck Institute for Ornithology, Germany;*

*Paul Kuchenbuch, Max Planck Institute for Ornithology, Germany;*

*Gudrun Müller, Max Planck Institute for Ornithology, Germany;*

*Barbara Fruth, Ludwig-Maximilian University, Germany; Centre for Research and Conservation/KMDA, Belgium;*

*Takeshi Furuichi, Kyoto University, Japan;*

*Roman M. Wittig, Max Planck Institute for Evolutionary Anthropology, Germany;*

*Simone Pika, Max Planck Institute for Ornithology, Germany*

Human language is a fundamentally cooperative enterprise, embodying fast-paced and extended social interactions. It has been suggested that it evolved as part of a larger adaptation of humans' species-unique forms of cooperation. Although, our closest living relatives, bonobos and chimpanzees show general cooperative abilities, their communication interactions seem to lack the cooperative nature of human conversation. Here, we revisited this claim by applying parameters of conversational analysis to gestural exchanges of mother-infant dyads of bonobos and chimpanzees living in four different communities in the wild. Results showed that communicative exchanges of both species are very similar to cooperative turn-taking sequences in human conversation. While bonobos were the quicker communicators and anticipated the behaviour of conspecifics, chimpanzees engaged in extended sophisticated negotiations. Our results thus strengthen the hypothesis that interactional intelligence paved the way to the cooperative endeavour of human language and suggest that social matrices highly impact upon communication styles.

Key words: human language, cooperation, communication, bonobos, chimpanzes

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## **COMBINATIVE SOCIAL LEARNING SCAFFOLDS INNOVATIVE TOOL-MAKING IN YOUNG CHILDREN**

*Elizabeth E. Price, Newcastle University, UK*

*Christopher Gallagher, Newcastle University, UK*

*Amy Rodway, Newcastle University, UK*

*Luisa Vaughan, Newcastle University, UK*

Cumulative culture requires both the invention of novel traits (innovation) and the transmission of these traits between individuals (social learning). Both innovation and social learning have been investigated in children with regard to tool use, but the combination of these two abilities, namely the possibility that social learning might facilitate innovation, remains underexplored. Here, children were tested on their ability to build a tool following a demonstration by one or two models, or in a baseline condition with no demonstration. Children were able to combine two demonstrated techniques to construct a tool and retrieve a reward on a novel task, outperforming children provided with no information. Furthermore, these children were as successful at building tools and solving the task as those provided with a complete demonstration of the solution (a model building the tool using both techniques). Results suggest that children may use their well-developed capacity for social learning to scaffold their less developed ability to innovate tools. The role of such combinative learning is discussed in relation to cumulative culture.

Key words: tool use, social learning, innovation, cumulative culture, children  
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## BEHAVIOUR-READING VERSUS MENTALISING IN EURASIAN JAYS

*Ljerka Ostojic, University of Cambridge, UK*

*Edward W. Legg, University of Cambridge, UK*

*Michael Mendl, University of Bristol, UK*

*Nicola S. Clayton, University of Cambridge, UK*

Evidence for mental state-attribution in non-human animals requires that animals respond to another's mental state without relying solely on observable behaviours indicating that mental state. Thus, 'behaviour-reading'; is usually regarded as an alternative to mental state-attribution. Here, we used Eurasian jays'; food-sharing behaviour to investigate whether or not the male can infer that the female has eaten food and thus experiences a decreased desire for that food solely from observing food going in and later coming out of the female's testing compartment. In addition to this inferential cue of the female's desire, we independently manipulated the female's behaviour during the sharing bouts by manipulating the type of food she actually ate. Neither the inferential cue nor the behavioural cue alone were sufficient to influence the male's sharing behaviour. Instead, the male relied on an interplay between the two cues: when the two cues conveyed different information, the female's behaviour interfered with the male's inference. Thus, male Eurasian jays may use inferences about the desire-states of their partner, suggesting that they are capable of desire-state attribution. In addition, our results emphasize how 'behaviour-reading' and state-attribution -rather than being alternatives- may represent complimentary information influencing social decision making in non-human animals.

Key words: Theory of Mind, desire-state attribution, 'behaviour-reading', corvids, Eurasian jays

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## **HUMAN-DIRECTED BEHAVIOUR BY GOATS DURING A PROBLEM SOLVING TASK**

*Christian Nawroth, Queen Mary University of London, United Kingdom*

*Jemma M. Brett, Queen Mary University of London, United Kingdom*

*Alan G. McElligott, Queen Mary University of London, United Kingdom*

Research on non-human animals covering human-directed behaviour often focusses on interactions between dogs and humans and is widely studied in canids. However, there has been little focus on livestock species that are domesticated for meat and milk, but not enhanced communication with humans. We investigated potential referential and intentional human-directed behaviour in goats. Goats were trained over three trials to remove the lid from a box in order to gain access to food. In a fourth trial, subjects were presented with an unsolvable version of the task in the presence of either a 'forward facing' or 'away facing' human experimenter. The human-directed behaviours (e.g. gazing at or approach towards the experimenter) during the unsolvable trial were analysed. Goats gazed towards the forward facing experimenter earlier and for longer. Goats also showed a higher amount of gaze alternations and a lower latency until the first gaze alternation when the experimenter was forward facing. These results present first evidence for referential and intentional human-directed communication in a livestock species.

Key words: attentional state, human-animal interaction, unsolvable task

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**DO FISH (*PTEROPHYLLUM SCALARE*) AND HUMANS (*HOMO SAPIENS*)  
APPLY SIMILAR NUMERICAL CRITERIA IN NUMEROSITY JUDGEMENTS?**

*Maria Elena Miletto Petrazzini, University of Padova, Italy*

*Christian Agrillo, University of Padova, Italy*

*Angelo Bisazza, University of Padova, Italy*

In recent years, numerous studies have shown that many animal species can be trained to discriminate stimuli differing in numerosity. However, to solve the task, subjects can apply two different strategies: either select the set containing a specific number of items (absolute numerosity rule), or select the larger/smaller set (relative numerosity rule). In the latter case, subjects are required to compare the stimuli and then derive a general rule. To date it is unclear which strategy is spontaneously used by non-human animals in numerosity judgments. Here we compared the performance of angelfish (*Pterophyllum scalare*) with that of adult humans (*Homo sapiens*) in a task in which subjects were initially trained to discriminate the array containing 10 dots (either in 5 vs. 10 or 10 vs. 20 comparison). Subsequently they were tested with the previously trained numerosity and a novel numerosity (respectively, 20 or 5). Both species spontaneously favored a relative rule, selecting the novel numerosity and were more accurate when trained to select the larger array as positive. On the whole these similarities, together with previous data in literature, support the hypothesis of shared systems for representing quantities among vertebrates.

Keywords: Numerical discrimination, operant conditioning, angelfish, humans

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## HOW MANY RAVENS DOES IT TAKE TO PREEN ONE? A SELF- AND SOCIAL PREENING COMPARISON

*Matjaž Hegedič, University of Ljubljana, Slovenia*

*Thomas Bugnyar, University of Vienna, Austria*

Grooming and its bird equivalent, preening, are ubiquitous activities in the animal kingdom. Social grooming - the grooming of others - has been emphasized to play an important part in the creation and maintenance of social bonds in primates. However, its role in the social lives of non-primates has received little attention. Therefore, we investigated and compared self- and social preening in common ravens (*Corvus corax*), who have complex social lives considered analogous to those of primates. We collected observational data on a group of 10 captive birds during the course of one year, by recording 'focal' videos, and coding them for preening behavior. We specifically coded the frequency, duration of preening, the body parts preened, and the identity of the preener. We found that social preening typically targets the areas harder to reach by individuals themselves, that it occurs predominantly between dyads with strong relationships, and that the amount of daily activity dedicated to it was found to be comparable to that of many primates. Our study provides the first in depth investigation of bird preening, and its results challenge the assumption of primates' uniqueness with regard to social grooming and its proximate and ultimate causes.

Key words: grooming, preening, ravens

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## **DOMESTIC CHICKS' EXPECTATIONS ABOUT THE PRESENCE AND THE ABSENCE OF AN OBJECT**

*Eszter Szabó, Central European University, Hungary*

Domestic chicks are known to have remarkable object representation capacities from a very early on. The aim of the present research was to investigate chicks' ability to encode information about the absence of objects. We used a looking time paradigm to investigate 8-day-old domestic chicks' expectations about a familiar object being present or not being present behind a screen. In Experiment 1 we measured how chicks encode the presence of an object by comparing two conditions. In the Expected Disappearance condition the object was removed while in the Unexpected Disappearance the target was hidden behind the screen. At the end of both conditions the screen was lowered and there was nothing behind it. Experiment 2 investigated how chicks represent absent objects. In the Expected Appearance condition the object was hidden behind the screen while in Unexpected Appearance the target was removed. Both conditions ended with revealing the target object behind the screen. Based on earlier research we expected longer looking and left-eye dominance for the unexpected compared to the expected events. While in Experiment 1 chicks were not sensitive to unexpected disappearance, in Experiment 2 they differentiated between expected and unexpected appearance and showed left-eye dominance for unexpected appearance.

Key words: object representation, absence, object maintenance

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## DO RATS RECOGNIZE NON-WORDS BY THEIR VOWELS OR THEIR CONSONANTS?

*Irene Torres, Universitat Pompeu Fabra, Spain*

*Juan M. Toro, Universitat Pompeu Fabra, Spain*

In a word recognition task, human adults rely more on consonants than on vowels to disambiguate between different words. Newborns use vowels to disambiguate lexical items. Furthermore, 5-month-old infants also focus on vowels to recognize their own name. It is not clear if the reliance on vowels at these early ages emerges from general cognitive biases that might be present in non-human animals. Here we explored whether rodents present any phonetic bias to recognize acoustic items. Rats were trained to discriminate between two CVCV synthesized non-words. We ran three different tests. We presented the animals with new non-words in which we modified the edge phonemes (XVCV and CVCX), the inner phonemes (CXCV and CVXV) or the two consonants and vowels (CXCV and VXCV) from the reinforced non-word. Our results show that rats focused on the vowel in the last syllable to recognize the reinforced non-word. We replicated this result in a second experiment in which we reduced the acoustic salience of the vowels by decreasing their duration and fundamental frequency. Our study suggests that rats, as human newborns, present a vowel bias to identify acoustic items.

Key words: rats, consonants and vowels, word recognition, acoustic salience

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## Poster sessions

### Poster Session I.: Friday, April 29, 10:00–11:30

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**Brain correlates of the conflict level in the multi-response Stroop task**

*Adam Chuderski, Magdalena Senderecka, Patrycja Kałamała, Bartłomiej Kroczek, Michał Ociepka*

**Coordination under conflict in chimpanzees (*Pan Troglodytes*), bonobos (*Pan Paniscus*) and children**

*Alejandro Sánchez-Amaro, Shona Duguid, Josep Call, Michael Tomasello*

**When it is risky smart birds go for less**

*Aleksei Maslov, Sofia Panteleeva, Zhanna Reznikova*

**Cognitive representations of risks and personality characteristics as moderators of health risks perception in scuba divers**

*Alina Krasnoryadtseva, Tatyana Kornilova*

**Subject's understanding of conditional sentences. Analysis of Socratic dialogs during solving various versions of Wason's selection task**

*Andrzej Gajda, Szymon Chlebowski, Mariusz Urbański, Emilia Soroko*

**Visual vs. olfactory learning in bearded dragons (*Pogona vitticeps*)**

*Anna Frohnwieser, Thomas W. Pike, John C. Murray, Karen Covalin, Anna Wilkinson*

**Neural mechanisms for speech processing in dogs**

*Anna Gábor, Attila Andics, Márta Gácsi, Tamás Faragó, Dóra Szabó, Ádám Miklósi*

**Similarities and differences between motherese and doggerel. An acoustic analysis**

*Anna Gergely, Krisztina Kovács, Ágoston Galambos, Tamás Faragó, József Topál*

**Sleep EEG spectrum and rapid eye movements as indicators of canine aging**

*Anna Kis, Sára Szakadát, Enikő Kovács, Márta Gácsi, Róbert Bódizs*

**The Greek "blé effect": Activation of L2 affects color discrimination**

*Asenia Giagtzidou, Armina Janyan*

**The role of Theory of Mind functions in language comprehension in infancy**

*Bálint Forgács, Eugenio Parise, Gergely Csibra, Judit Gervain*

**Relational length discrimination and the Müller-Lyer illusion in dogs**

*Benjamin Keep, Anna Wilkinson, Helen E. Baumber*

**EEG signatures accompanying auditory figure-ground segregation**

*Brigitta Tóth, Zsuzsanna Kocsis, Gábor P. Háden, Ágnes K. Szerafin, Barbara Shinn-Cunningham, István Winkler*

**A Decade Later: Adolescents' Memory for Medical Emergencies**

*Carole Peterson*

**Earliest Memories - Forgotten or Misdated?**

*Carole Peterson*

**Women choose to learn socially when asocial learning is risky**

*Charlotte O Brand, Gillian R Brown, Catharine P Cross*

**Brightness illusions are fishy for fish too (*Poecilia reticulata*)**

*Christian Agrillo, Maria Elena Miletto Petrazzini, Angelo Bisazza*

**Poster Session II.: Friday, April 29, 14:30–16:00**

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**Intuitive Optics: what nonhuman apes infer from mirrors and shadows**

*Christoph J. Völter, Josep Call*

**A framework for studying self- domestication**

*Constantina Theofanopoulou*

**The rivalry between competitive and cooperative models of the evolution of the mind**

*Csaba Pléh, Ottilia Boross*

**Mental lexicon: two sides of hierarchical organization from big data**

*Dániel Czégel, József Venceli, Domicián Kovács, András Szántó, László Kovács, Csaba Pléh*

**Intonation and tone: nature and nurture**

*Edward Ruoyang Shi, Elizabeth Qing Zhang*

**Do jays know where their partners will go?**

*Edward W. Legg, Ljerka Ostojić, Nicola S. Clayton*

**Emergent conformity in cumulative culture**

*Elena Miu, Ned Gulley, Luke Rendell*

**Why did vocalizations come to predominate gestures in the evolution of language?**

*Elizabeth Qing Zhang*

**Leadership and personality associations in owner and two dogs triads**

*Enikő Kubinyi, Máté Nagy, Juan Jose Ablenado, Rianne von Hoof, Tamás Vicsek*

**Autobiographical memory, self-knowledge and shifting narrative perspective: a discourse analytic study of psychoanalytic therapy**

*Eszter Berán, Zsolt Unoka*

**The ability of interpreting others' intent in dogs**

*Eszter Petró, Szilvia Tóth, Ádám Miklósi*

**Do dogs use emotional expressions to infer preference?**

*Flóra Szánthó, Elodie Gilmert, Enikő Kubinyi, Ádám Miklósi*

**Sweet delusion: no effect of glucose consumption on self-control depletion**

*Florian Lange*

**14-month-olds anticipate others' actions through belief attribution in an unexpected-identity task**

*Frances Buttelmann*

**Spatiotemporal individuation is harder for infants when presented with animated displays compared to live demonstrat**

*Gabor Brody, Csibra Gergely*

**Effects of labels and visual similarity on categorization in 9-month-old infants**

*Hanna Marno, Gert Westermann, Eugenio Parise*

**Extremely low birthweight infants; gender differences in developmental quotient**

*Irmelin Hovland-Hegg, Anett Nagy, Anna Beke, Renáta Cserjési*

## **Poster Session III.: Saturday, April 30, 10:00–11:30**

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**Distinct developmental expression of phosphorylated tau in Down syndrome brains**

*Jasna Jarc, Ivan Milenkovic*

**A novel food experiment reveals model-based biases in social learning in a wild population of vervet monkeys**

*Jennifer Botting, Andrew Whiten, Erica van de Waal*

**Sapiens: the only ape with vocal learning**

*Joana Rosselló*

**Vocal Imitation of Conspecific Sounds and Human Speech in the Killer Whale (*Orcinus orca*)**

*José Z. Abramson, Victoria Hernández-Lloreda, Francisco Aboitiz, Fernando Colmenares, Josep Call*

**Probability effects in perceptual decision making across species**

*József Arató, Abbas Khani, Gregor Rainer, József Fiser*

**An ethological approach to social evaluation**

*Judit Abdai, Ádám Miklósi*

**Evolution of the red panda (*Allures fulgens*) and the family Ailuridae**

*Kamilla Pléh*

**Sound and syllable discrimination in stroke patients with severe comprehension disabilities as reflected in mismatch negativity (MMN)**

*Karolina Lice, Marijan Palmović*

**Selective Imitation of Culturally Knowledgeable Informants in 3-year-old Children**

*Katalin Olah, Fruzsina Elekes, Ildikó Király*

**Infants are efficient learners, selecting the optimal source and optimal type of information to learn**

*Katarina Begus, Teodora Gliga, Victoria Southgate*

**Is It a Bird? Is it a Plane? - Detection of biological motion by Western scrub-jays**

*Katharina F. Brecht, Ljerka Ostojić, Nicola S. Clayton*

**Competition and cumulative culture: the monster game**

*Keelin Murray*

**Working memory capacity, school achievement, and physical fitness: A latent variable analysis**

*Kristóf Kovács, Boglárka Faragó, Mária Dávid*

**Association between the variants of the oxytocin receptor gene and gaze following behaviour in human infants and adult dogs**

*Krisztina Kovács*

**Determining emotional value of photograph stimuli**

*Lea Jakob, Ivana Vahtarić, Sanja Budimir*

**A new experimental approach probes cultural innovation and transmission in young children**

*Lewis Dean, Emily Burdett, Vanessa Burgess, Amanda Lucas, Daniel van der Post, Andrew Whiten*

**Theory of mind abilities in patients with borderline personality disorder and major depression: a meta-analysis**

*Mara J. Richman, Zsolt Unoka*

## **Poster Session IV.: Saturday, April 30, 14:30–16:00**

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### **Different Eyes but Similar Processing? Visual cognition in the jumping spider**

*Massimo De Agrò, Lucia Regolin, Enzo Moretto*

### **Frequency of occurrence facilitates phonological structures learning**

*Mirta Zelenika*

### **Same versus foreign language use by ostensive demonstrators influence the likelihood of correcting over-imitation in preschoolers**

*Nazli Altinok, Mikolaj Hernik, Ildiko Kiraly, Gyorgy Gergely*

### **Abilities of recognize and to produce sequence of movements: how they are necessary for purposeful behaviour**

*Olga B. Sizova*

### **The role of sensory consonance in the detection of abstract rules: a comparison across species**

*Paola Crespo-Bojorque, Juan M. Toro*

### **Just a matter of (cognitive) control? Insights from studies of false memories in the DRM paradigm**

*Patrycja Maciaszek*

### **Generalizing rules over clicks: Preliminary results**

*Pedro Tiago Martins, Juan Manuel Toro, Luca Bonatti*

### **Innovation and flexibility in chimpanzees in response to a changing foraging task**

*Rachel Harrison, Edwin van Leeuwen, Andrew Whiten*

### **Using eye movements to investigate the automatic processing of other's desires**

*Rachel May Crosby, Ljerka Ostojić, Edward W. Legg, Nicola S. Clayton*

### **Abstract patterns learning in baboons**

*Raphaëlle Malassis, Arnaud Rey, Joël Fagot*

**Revisiting the role of the hippocampus in vocal learning**

*Saleh Alamri, Elizabeth Qing Zhang*

**Do monkeys compare themselves to others?**

*Stefanie Keupp, Thomas Bugnyar, Thomas Muszweiler, Julia Fischer*

**Sex-specific utilisation of subtle cues in foraging bumblebees**

*Stephan Wolf, Mark Roper, Lars Chittka*

**Individual Differences in Performance on Iowa Gambling Task are related with personality traits of Risk Readiness and Rationality**

*Tatiana Kornilova, Maria Chumakova*

**Stimulus equivalence in baboons: does categorization promote symmetry?**

*Tiphaine Medam, Yousri Marzouki, Marie Montant, Joël Fagot*

**How to access others' minds? Using experience projection to test automatic processing of others' beliefs**

*Yvette Kalaba, Edward W. Legg, Ljerka Ostojić*

## Abstracts – Posters

### *Session I.*

#### **Brain correlates of the conflict level in the multi-response Stroop task**

*Adam Chuderski, Jagiellonian University, Poland  
Magdalena Senderecka, Jagiellonian University, Poland  
Patrycja Kałamała, Jagiellonian University, Poland  
Bartłomiej KroczeK, Jagiellonian University, Poland  
Michał Ociepka, Jagiellonian University, Poland*

Our EEG study (N = 33) examined event-related potentials associated with conflict between activated responses in the Stroop task, in order to verify the conflict monitoring theory of human cognitive control, which predicts the strength of exerted control to be proportional to the detected level of conflict. However, existing research manipulated the sole presence/absence of conflict, but not its exact level. Here, by using a modified color-word task that allowed multiple correct responses for target colors, as well as multiple incorrect responses for distractor words, we manipulated the level of conflict among activated responses (and not only its presence). We assumed that when the more incorrect responses were primed, the more pronounced conflict-related potentials would be observed. Indeed, two components of the N450 wave, parietal negativity and medial frontal negativity, were more negatively deflected when conflict was higher, than when it was lower, visibly responding to the level of conflict. Slow potential responded to the sheer presence of conflict, but not to its level. The results can be plausibly explained by the conflict monitoring theory, though only when its conflict evaluation formula is modified, whereas they are at odds with several alternative theories of cognitive control.

Key words: cognitive control, conflict monitoring, EEG, Stroop task

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## **Coordination under conflict in chimpanzees (*Pan Troglodytes*), bonobos (*Pan Paniscus*) and children**

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Social primates need to coordinate their actions even when conflicts of interest arise (e.g. hunting parties). The Snowdrift game provides a model to test decision-making in these situations. In study 1, 10 chimpanzee and 20 children dyads were presented with access to an unequal reward distribution. In the critical condition they could only obtain the higher reward by letting a partner act; with the risk that if neither acted the rewards would be lost. Both chimpanzees and children were successful at solving the dilemma. One individual almost always (over 95% in both species) paid the cost of taking the lower value reward rather than thus avoiding coordination failure. Both species waited longer for their partner to act when this would lead to a higher reward. However, evidence from their resource distributions, their action latencies and their communicative acts suggests that children behaved more strategic than chimpanzees. In a second study we tested chimpanzee and bonobo dyads in the same paradigm with the addition of an opting out option that allowed them to obtain a secure reward. Our results demonstrate that apes and children successfully coordinate their actions in conflict situations although both species differ in the way they achieve coordination.

Key words: coordination, conflict, decision-making, snowdrift-game, risk

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## **When it is risky smart birds go for less**

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The risk in risk-sensitive foraging is usually considered in the form of metabolic loss while handling prey and searching for new food patches, rather than in the form of danger coming from the prey. We simulated the situation of risky hunting in the great tits to examine whether these birds are able to make a choice between small and large quantities of live prey, both tasty and dangerous. We use red wood ants with whom passerine birds share territories in forest habitats. We placed tits one by one into specially designed cages in which they could choose between “food patches”

containing ant groups of different quantities. Ants served both as food items and as a source of danger. We found that birds choose at random between 5 and 10, and they prefer more ants when choosing between 10 and 25. This means that tits value ants as food and quantities within this range do not bother them much. However they always go for the smaller quantity when choosing between 10 and 50 ants, thus displaying the capacity for distinguishing between more and less in order to ensure comfortable hunting.

Key words: risk-sensitive foraging, great tits, ants

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### **Cognitive representations of risks and personality characteristics as moderators of health risks perception in scuba divers**

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This study examined interconnections between personality characteristics, cognitive representations of health risks and self-evaluations of riskiness in scuba divers. We hypothesized health risk perception is a process mediated by interrelations between personality characteristics and cognitive representations of risks and that there are individual differences in those interrelations in subjects with different levels of expertise in scuba diving. The sample included three groups of male scuba divers with various levels of proficiency, including novice, experienced divers, scuba diving instructors and a group of male non-diving individuals. Personality questionnaires and psychometric approach were used. The results suggest that similar risk perceptions are moderated by different interrelations between personality characteristics and cognitive representations of risks. For example, optimistic bias regarding the probability of diving accidents shown by novice divers appeared to be related to their cognitive representations of risks and diving experience. However, the level of comparative pessimism, which was revealed in experienced divers, was better predicted by the number of known diving risks, confidence in personal guesses about dive accident probabilities and tolerance for uncertainty. Scuba diving instructors' pessimism bias was related to readiness for risk and riskiness self-evaluation. This research was supported by grant no.15-06-10404a from the Russian Foundation for Humanities.

Key words: risk perception; cognitive representations of risk, optimistic bias, decision-making, tolerance for uncertainty

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## **Subject's understanding of conditional sentences. Analysis of Socratic dialogs during solving various versions of Wason's selection task**

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Low rates of correct answers in the Wason selection task in an abstract setting have long been interpreted as a major blow to so-called logicism in the psychology of reasoning. They also have given rise to experiments aimed at deepening insights into reasoning with conditionals in humans. In particular, research by Keith Stenning and Michiel van Lambalgen showed that certain modifications to the task facilitate classical interpretations of conditionals. In our replication of their experiments (N = 158) it turned out that, on the contrary to the expectations, in some cases those modifications suppress normatively correct answers. Thus we carried out a set of Socratic dialogues on two groups of subjects (N = 60), differing with respect to expertise in formal logic. We employed Stenning and van Lambalgen's five versions of the Wason selection task with two conditions: in the first one cards presented to the subjects supported the rule given in the task, while in the second one they did not. The results support the claim that modifications of the task facilitate correct solutions in case of subject with no expertise in formal logic, while in case of subjects with substantial expertise there is no such straightforward relationship. The project is partially funded by National Science Centre (Sonata-Bis grant, DEC-2013/10/E/HS1/00172).

Key words: Wason's selection task, reasoning, Socratic dialogues, abstract tasks  
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## **Visual vs. olfactory learning in bearded dragons (*Pogona vitticeps*)**

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Learning about the environment is vital for survival, and different species attend to different perceptual cues, which is likely to depend on their sensory systems and experience. Very little is known about stimulus salience in reptiles. Using a classical conditioning procedure we trained bearded dragons (*Pogona vitticeps*) to associate a particular colour (C+) and scent combination (S+) with a positive environment, and a different colour (C0) and scent (S0) combination with a neutral environment. Animals were then given a binary choice between the stimulus combinations, in four testing

conditions: C+S+ vs. C0S0; C+S0 vs. C0S+; C+ vs. C0; and S+ vs. S0. The animals chose the positive colour and scent combination significantly more often than the neutral colour and scent combination, and, when the cues were put in conflict, preferred the positive colour over the positive scent. This is one of the first studies comparing visual and scent learning in reptiles and therefore provides valuable insights into their perceptual capabilities and the information that they attend to in the environment when making decisions.

Key words: animal cognition, reptiles, perception

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### **Neural mechanisms for speech processing in dogs**

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Communicative content of human speech relies on what we say (lexical information, word meaning) and how we say it (prosodic information, intonation). The interpretation of human vocal social signals is highly important for dogs. It is known that several vertebrate species are able to process specific cues in human speech, but the segregation and integration of lexical and prosodic cues has so far remained unexplored in non-human animals. In this study we investigated for the first time, using fMRI, if there are human-like neural mechanisms for processing human speech in dogs. We used praising vs. neutral word meanings, with praising vs. neutral intonations. According to our results, the processing of lexical information was more pronounced in the left hemisphere, while the processing of prosodic information involved auditory regions in the right hemisphere, just like in case of humans. In reward-sensitive regions of the dog brain (ventral tegmental area, nucleus caudatus) we found that activity was highest when both word meaning and intonation were praising, suggesting that dogs are able to integrate the two types of speech information. Our findings demonstrate the existence of pre-linguistic processing skills in a non-primate species.

Key words: dog, fMRI, speech processing, praise

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## **Similarities and differences between motherese and doggerel. An acoustic analysis**

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There has been a growing evidence that pet talk (or doggerel) and infant directed speech (or motherese) have similar acoustic characteristics such as high-pitch register, repetitiveness, and attention-getting devices, however it is still unclear whether doggerel and motherese have gender, age or context dependent acoustic and/or linguistic features. In the present study we collected infant directed (ID), dog directed (DD) and adult directed (AD) speech in four different context (getting attention, task, teaching and fixed speech situations) from parents whose infants were 0-30 months old and who also had dog at home (N=18 male, 21 female). We hypothesized that AD signals will be markedly different from ID and DD signals, while only minor differences are expected between the latter two. Our results supported our assumptions as we found higher fundamental frequency (F0) in both female and male participants during ID and DD speech compared to AD signals independently from the given context. However F0 range was higher during DD signals compared to AD speech only in females as males used same F0 range toward dogs and adults. Last but not least, we found evidence that acoustic features of the ID signal toward 0-18 months-olds resemble most to the DD speech.

Key words: motherese, doggerel, human-dog communication

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## **Sleep EEG spectrum and rapid eye movements as indicators of canine aging**

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Dogs (*Canis familiaris*) have been shown to be an ideal model of human behaviour including cognitive aging. However, easy to measure psychophysiological variables that covary with age in humans are largely unexplored in dogs. The present study investigates two such variables: the spectral aspects of sleep EEG and the density of rapid eye movements during REM sleep. Canine subjects participated in a 3-hour-long polysomnography recording, the protocol of which was developed and validated based

on human studies. Dogs' age was related to the spectral features of the sleep EEG. Similarly to previous findings on humans, older dogs showed a decrease in relative delta power during Slow Wave Sleep (SWS) and REM sleep, and an increase in relative alpha (SWS, REM) and beta (SWS, REM) power. Density of rapid eye movements during REM sleep increased with age, which is a pattern opposite to what has been observed in humans. These results show that simple psychophysiological measures such as sleep EEG spectrum and density of rapid eye movements during REM sleep can be measured in dogs. Furthermore we revealed that canine data in some respect paralleled while in part differed from what has been observed in human aging. Supported by NPPGR.

Key words: dog, sleep EEG, aging

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### **The Greek "blé effect": Activation of L2 affects color discrimination**

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Speakers of different languages differ in many ways including ways of thinking about colors. For instance, a study showed that Russian speakers that have two different names for lighter and darker blue discriminate the colors differently from English speakers who do not have this linguistic distinction between the blues. The RT of color discrimination of the Russian speakers was highly influenced by categories: color discrimination of the same category (e.g., dark blue) was slower than that of different categories (dark and light blue). The Russian "blue" effect was also influenced by a verbal task suggesting that the effect was due to the language and not something else. The aim of the current study was to test the effect of Russian blues on the Greek blé (blue) that also has two linguistic categories of blue. Moreover, the study tests the hypothesis that activation of a second language that has no differentiation between the categories would still influence the "blue" effect. Greek-English bilinguals were run through color discrimination and word memorizing (in English) tasks. The results unambiguously showed that the verbal task affected color discrimination RT: the magnitude of the effect (same vs. different categories) was larger after the verbal task.

Key words: language, verbal interference, color discrimination

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## **The role of Theory of Mind functions in language comprehension in infancy**

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Infants already at 7 months of age seem to be tracking other people's beliefs, and under certain conditions, already at 9 months of age seem to exhibit sensitivity to semantic incongruity. In our study we wanted to investigate whether infants evaluate utterances from the perspective of a potential communicative partner. We presented various toys to 14-month-old infants, named them in the presence of an adult observer, and measured their electroencephalogram (EEG). The object was always named congruently from the perspective of the infant, but it was named congruently only half of the time from the perspective of the observer, who on the other half of the time had a false belief about the identity of the object, hence experienced an incongruent naming. Preliminary analysis of the ERPs revealed that the label incongruent for the observer evoked a greater negativity in the 300-500 ms time window over centro-parietal electrode sites in infants compared to the label congruent for both parties ( $p < .05$ ). Further analyses and control experiments are under way, but the present finding already suggests that infants use their language comprehension system right from the onset to evaluate not only their own, but also their communicative partner's comprehension.

Key words: cognitive development, n400, theory of mind, infancy, language

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## **Relational length discrimination and the Müller-Lyer illusion in dogs**

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Understanding canine visual cognition is important both to better understand cognitive processes at a fundamental level and also because dogs are used as a model in studies relating to humans (e.g. human cognitive dysfunction). Visual illusions transpire when a stimulus is perceived as having different characteristics to its physical properties. They have been used to investigate species similarities and differences in visual processing. We used automated touchscreen technology to investigate whether dogs could discriminate continuous quantity based on a relational rule. Dogs were then tested for generalisation and discrimination threshold. We modified the stimuli to test dogs' perception of a visual line length illusion. Dogs learned the initial discrimination, generalised to novel stimuli and discriminated between lengths that differed by as little

as1cm. Further they successfully transferred this to Müller-Lyer stimuli. The results revealed that dogs can learn a relational rule during a simultaneous discrimination task; however, the rule used may differ according to the individual. The illusion results suggest that dogs' may perceive the Müller-Lyer illusion; however, analyses revealed alternative stimulus features were likely used to make the discrimination. These results further our understanding of dogs visual processing and have implications for future research using visual discrimination paradigms.

Key words: visual cognition, relational learning, visual illusion, Müller-Lyer illusion, dog

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### **EEG signatures accompanying auditory figure-ground segregation**

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Repetitive tonal elements may form a pattern, which can be detected as a figure over a stochastic background. This phenomenon is termed auditory figure-ground segregation and it is an important step in the process of auditory object formation. We recorded the electroencephalogram while listeners were instructed to detect such figures. Figure detection elicited the object related negativity (ORN) and the P400 event-related potentials (ERP), which have been previously shown to reflect the presence of two concurrent sounds. Increasing the number of consecutive repeated chords (coherence) and/or the number of repetitions (duration) increased the detection performance as well as the amplitude of both ORN and P400. However, only the latter correlated with the detection performance. These results suggest the 1) ORN and P400 may reflect processes contributing to the separation of concurrent auditory objects; 2) ORN probably represents the likelihood of the presence of two or more concurrent sound objects, whereas the P400 generating process is likely involved in the perceptual decision regarding the presence of multiple auditory objects.

Key words: perceptual object, auditory scene analysis, figure-ground segregation, event-related brain potentials (ERP), object-related negativity (ORN)

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## **A Decade Later: Adolescents' Memory for Medical Emergencies**

*Carole Peterson, Memorial University of Newfoundland, Canada*

A decade earlier, 39 adolescents (3-5 years old at the time of event occurrence) were interviewed about stressful injuries serious enough to require hospital emergency room treatment. Parent witnesses were also interviewed to provide a record against which children's recall was compared. Prior to the current follow-up, adolescents had varying numbers of interviews (2-5), and half had been interviewed 5 years previously whereas the remainder had not been interviewed for at least 8 years. Hypothesis: Recall of the injury would still be excellent, but recall of hospital treatment would be poorer. More intervening interviews would also help, as well as recency of last interview. Results: In spite of the long delay and young age of the adolescents at event occurrence, recall of their injury was still excellent in completeness, unique narrative detail, and accuracy, although there was a small decrease in accuracy. However, recall of hospital treatment was poorer and showed significant deterioration. In addition, presence of an interview after 5 years (halfway through the 10-year delay) as well as number of interviews had no significant effect on 10-year recall of either event, although more interviews tended to make free recall of the injury more detailed.

Key words: child memory, autobiographical memory, injury, longitudinal research, repeated interviews

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## **Earliest Memories - Forgotten or Misdated?**

*Carole Peterson, Memorial University of Newfoundland, Canada*

Childhood (or Infantile) Amnesia is the inability to remember events from very early in one's life. A widely accepted belief is that the average age of earliest memory is 3.5 years, a 'fact' widely presented in textbooks. However, although many early memories are indeed forgotten or inaccessible, new research supports a different partial explanation for this 'amnesia.' Some memories from age 2 are not forgotten; they are systematically misdated. Wang and Peterson showed that Canadian and Chinese children dated events occurring before they turned 4 (according to parental report) to a few months later. In longitudinal research, 4-13-year-old Canadian children who recalled the same memories twice, separated by 2 years, re-dated the memories to 8 months later. In the present study, these same children were re-interviewed about the same memories after 8 years. Hypothesis: Re-dating would continue for still remembered events. Results: Children now post-dated these same events to more than a year later than initially. Thus, older children and youth were typically recalling

events that occurred when they had been 2-year-olds, but over time they re-dated the memories, consistent with a telescoping explanation of memory dating. Implication: Textbooks are wrong. Our memories are earlier than we think.

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### **Women choose to learn socially when asocial learning is risky**

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*Catharine P Cross, University of St Andrews, United Kingdom.*

Learning something new asocially (or ‘innovating’) is associated with personality traits such as boldness and risk-taking in a range of taxa including fish, birds and even invertebrates. In non-human primates, males tend to innovate more than females. We investigated whether the well-documented sex difference in human risk-taking results in a corresponding sex difference in social learning. Male and female participants (n=88) were given a computer-based task that involved constructing a virtual spaceship. Participants were given the option of using social or asocial information to complete the task. In Condition 1, social information was ‘risky’ in that choosing it could lead to large increases or decreases in the participant’s score. Asocial information was ‘safe’ in that it guaranteed that the participant’s score remained the same, or increased slightly. In Condition 2, social information was ‘safe’ and asocial ‘risky’ and in a control, both options were safe. We modelled the likelihood of choosing social information using Bayesian MCMC methods. Women exhibited a strong preference for using social information when asocial information was risky, whereas men’s preference for asocial information remained consistent irrespective of risk. This is the first evidence that sex differences in risk-taking underpin sex differences in human social learning. (Funded by the John Templeton Foundation).

Key words: social learning, innovation, sex differences, risk-taking

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## **Brightness illusions are fishy for fish too (*Poecilia reticulata*)**

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*Angelo Bisazza, University of Padova, Italy*

A long-standing debate surrounds the issue of whether human and non-human species share similar perceptual systems. One experimental strategy to compare visual perception of vertebrates consists in assessing how animals react in the presence of illusory patterns. To date, few studies have investigated the perception of visual illusions in fish. In the present study we investigated whether guppies (*Poecilia reticulata*) perceive the brightness illusion, a well-known illusion occurring when two objects, identical in physical features, appear to be different in brightness. Subjects were initially trained to discriminate which rectangle was darker or lighter between two otherwise identical rectangles. After reaching the learning criterion, guppies were presented with the illusory pattern: two identical rectangles inserted in two different backgrounds. Guppies previously trained to select the darker rectangle showed a significant choice of the rectangle that appears to be darker by human observers (and vice versa). The human-like performance exhibited in the presence of the illusory pattern suggests the existence of similar perceptual mechanisms between humans and fish to elaborate the brightness of objects.

Key words: Visual illusion, Simultaneous contrast, Comparative perception

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## Session II.

### **Intuitive Optics: what nonhuman apes infer from mirrors and shadows**

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*Josep Call, Max Planck Institute for Evolutionary Anthropology, Germany*

Great apes have been shown to use physical effects of hidden food (e.g. its weight) to infer its presence. This study aims at extending these findings to optical effects such as shadows and mirror images. To this end, we presented chimpanzees (*Pan troglodytes*), bonobos (*Pan paniscus*), and orangutans (*Pongo abelii*) with situations in which they could locate a food reward based on its mirror image or shadow. We found that all examined ape species used these cues to find the food. Follow-up experiments provided evidence that apes did not confuse such optical effects with the food rewards; neither did they merely associate these cues with food. First, apes used the mirror image to estimate the distance of the hidden food from their own body and, depending on the distance, either pointed at it or tried to access the food directly. Second, when we presented naïve chimpanzees with shadows or perceptually similar and equally deterministic rubber patches as predictor of the hidden food, they used the shadows but not the rubber patches. Together, these results suggest that apes can infer the cause of mirror images and shadows, which might also be a prerequisite for their outstanding performance in mirror self-recognition tasks.

Key words: problem-solving, causal cognition, physical cognition, diagnostic inference, primate cognition

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### **A framework for studying self- domestication**

*Constantina Theofanopoulou, University of Barcelona, Spain*

Buiding on evidence coming from genetics, primatology and behavioral studies, I seek to shed light on self- domestication, taking the differences between bonobos (self-domesticated) and chimpanzees (wild) as a case study. More specifically, the aim of the poster is to demonstrate a reasonable linking thread among the various characteristics of self- domestication: departing from the genetics that co-determine paedomorphic facial characteristics, neotenic skull shape and low levels of aggression to finally comprehend how this emotional intelligence crafts a different system of communication in the species under research (a more gestural system in the case of chimpanzees and a system enriched with flexible vocalizations in the case of bonobos). More importantly, this case study provides a general framework that could be

employed for other self- domesticated vs. wild pairs (for example: Bengalese finches vs. white- rumped munia, *Procolobus kirkii* vs. *Procolobus tephrosceles*).

Key words: self-domestication, genetics, neoteny, aggression

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## **The rivalry between competitive and cooperative models of the evolution of the mind**

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In the 150 years history of modern evolutionary theories of the human mind there is a peculiar sequence of rival models reappearing. This historical survey shall present two stages of this development, early birth of evolutionary models of the mind in late 19th Century, and modern developments starting with the reemergence of evolutionary psychology from the 1980s.

### 1. The beginnings in 19th Century

- a. Adaptation explained by competition. The 'survival of the fittest'; ideas in Darwin and Spencer. Interspecies and within species competition. Sexual selection in the 'social models'. Multiple selection in Karl Bühler.
- b. The early cooperative biological models. Kropotkin, Mechnikov, Huxford. Cooperation on the level of histology.
- c. Early synthetic attempts. J.M. Baldwin. Selection supplemented by model following as a social factor.

### 2. Late 20th Century

- a. The general adaptation-selection model of evolutionary psychology. Mind is a set of adaptations, each of which is explained by selection pressures. Cosmides-Tooby, Pinker.
- b. Introduction of sexual selection and the issue of art and other useless activities. G. Miller.
- c. New social models. Cooperation. A combination of theory of mind and its attribution. The novelty of the new social approaches. Tomasello, Gergely and Csibra.

### 3. A time for synthesis?

Key words: Evolution, selection, conflict, cooperation

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## **Mental lexicon: two sides of hierarchical organization from big data**

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*András Szántó, Budapest University of Technology and Economics, Hungary;*

*László Kovács, University of West Hungary, Hungary;*

*Csaba Pléh, Central European University, Hungary*

The objective of this study is to relate the structure of two different human products reflecting the hierarchical organization of the mental lexicon, namely corpus statistics and word association networks. Based on the idea of Altmann et al. (2009), a possible characterization of concreteness/abstractness of words can be obtained from the inter-event time distribution of the given word in the corpus: more concrete words exhibit burstier appearance. On the other hand, recent methods of network science (Czégel & Palla, 2015) make it possible to extract the hierarchical organization of word association networks, based on the idea that directed paths in association networks point from concrete towards abstract words more often than vice versa. Comparing the hierarchical organization of words obtained by applying the two aforementioned methods to different Hungarian and English corpora and association networks allows us to identify what are the common principles governing both of these processes and thus might be associated with real features of the representation of language and, by contrast, what are the differences suggesting that those features do depend on the type of data (i.e., text or associations) and consequently not universal.

Key words: mental lexicon, hierarchy, corpus statistics, word association networks

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## **Intonation and tone: nature and nurture**

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Intonation and tone are acknowledged as a suprasegmental tier of phonology (Goldsmith, 1976). In this paper we propose that pitch production is innate and comes from emotive vocalizations which are already present in non-human animals produced by ACC (anterior cingulate cortex)-PAG (periaqueductal gray)-brainstem pathway, and the mapping to the language as intonation and tone is acquired via modulating the pitch by the striatum after exposed to linguistic experience. The ACC-PAG-brainstem pathway is shared between humans and non-human mammals for producing innate vocalizations, and ACC is involved in emotive vocalizations. Zimmermann, Leliveld & Schehka (2013) made a comprehensive cross-taxon comparison of nonhuman mammalian voices, providing evidence for the prehuman origin hypothesis of affective

prosody. The striatum is involved in pitch processing in humans (Doelling & Poeppel, 2015) and pitch reinforcement learning of birdsong (Ali et al., 2013). The dopamine-dependent cascading interconnectivity between basal ganglia and limbic system sets up the neural connection between the innate pitch production and emotion, and the mapping to the linguistic units afterwards.

Key words: suprasegmental phonology, ACC-PAG-brainstem pathway, striatum

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### **Do jays know where their partners will go?**

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Paradigms using anticipatory looking (looking in expectation of an event happening) have been successfully employed to study Theory of Mind in young children whose explicit verbal responses cannot be relied upon. In these studies children look towards locations where they expect a protagonist to reach for an object, including cases where the protagonist has a false belief about the object's location. Recently similar paradigms have been used to test non-human primates. Here, we tested whether male Eurasian jays would look in anticipation of where their partner would search for a hidden food reward. The male jays did not show anticipatory looking behaviour when their partner either had a false belief or a true belief about the hidden food's location. The jays' failure to show anticipatory looking when their partner had a false belief could be interpreted as a lack of Theory of Mind. However, the failure to elicit anticipatory looking even in the true belief condition indicates that the jays were not engaging in any form of action anticipation. Further experiments will be necessary to determine why the jays failed to anticipate their partner's actions.

Key words: Theory of Mind, Social Cognition, Corvids

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## **Emergent conformity in cumulative culture**

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Cumulative culture, the ability to progressively build on the achievements of previous generations, is a central aspect of human uniqueness, but its dynamics are still poorly understood in anything beyond simple laboratory experiments. We analyzed the evolution of a sample of 48000 entries submitted to 20 computer coding competitions over 15 years. Entries were completely public - participants could submit a novel solution, modify an existing one, or any combination thereof. Therefore, contests were microcosms of cumulative cultural evolution. We measured the extent to which copying takes place, and what its consequences are on the diversity of culture. Results show that as improvement becomes progressively more difficult, and more valuable information accumulates, populations focus on copying and improving the current best entry. We observed patterns of convergence, punctuated by leaps from one idea to another, which lead to a decrease in cultural diversity, as the population performs increasingly similar 'behaviours'. When complex solutions are built through cumulative culture, conformity does not necessarily have to be the result of a cognitive process that drives individuals to copy the majority - it could be an emergent pattern in a population of individuals independently copying the best idea at the time. The question of whether this emergent conformity is an optimally adaptive approach to complex problems remains open.

Key words: cumulative culture, cultural evolution, conformity

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## **Why did vocalizations come to predominate gestures in the evolution of language?**

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I propose that the initial reason why vocalizations predominated gestures in speech evolution lies in the auditory advancement in humans. The precision of auditory perception is known to be indispensable for learning tutor songs in birds and speech in humans. Non-human primates lag behind humans in auditory discrimination, auditory detection and auditory long-term memory (Kojima, 2003). Similarly, the vocal non-learning birds are worse than vocal learning birds in pitch discrimination (Cynx, 1995); songbirds have special nuclei for auditory memory (Bolhuis & Gahr, 2006); zebra finches and budgerigars are even superior to human auditory discrimination ability (Lohr et al., 2006). In humans, the auditory processing of speech is performed by a ventral stream dealing with phoneme and lexical recognition and combination,

and a dorsal stream engaging in the sensorimotor transformation in language production (Hickok and Poeppel, 2004). Studies have demonstrated that the human superior temporal cortex projects more massively and reciprocally to the premotor area and also more intensively to the neostriatum (Rilling et al., 2008) than in chimpanzees and monkeys. This could have led to a more precise perception of auditory input, resulting in vocalizations predominating over gestures in the evolution of language.

Key words: vocalizations, auditory perception, temporal cortex

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### **Leadership and personality associations in owner and two dogs triads**

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Recently we detected leader-follower relationships in a family dog group during free (off-leashed) walks. We used a directional correlation analysis to quantify the fast, joint direction changes of dog pairs. With this method we could not detect owner-dog interactions, because the timescale of the owner's direction changes was much larger than that of the dogs. In the present study we asked owners to change directions often while walking and running with two of their dogs. We collected trajectory data using high frequency GPS loggers about 50 dogs (25 pairs) and their owners. Additionally, we tested dogs' reaction to a short separation from the owner, obedience, and dominance status in feeding and calling situations. Owners filled out a questionnaire about the personality of their dogs. Our results show that owners have significant role in leading, and dogs display huge but consistent variability in following the owners. The motion patterns of dogs are linked to factors of the personality questionnaire (excitability/activity and trainability) and reaction to the separation and obedience during the behaviour test. Dominance status assessed by the behaviour test is linked to „aggression towards animals” questionnaire factor. These findings provide further support for automated animal personality and dominance status measurements (MTA 01 031).

Key words: excitability, personality, dominance, motion path analysis, dog

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## **Autobiographical memory, self-knowledge and shifting narrative perspective: a discourse analytic study of psychoanalytic therapy**

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Background: The autobiographical memory system as described by Conway is based on three types of self-knowledge: life-time periods, general events, and event specific knowledge. These different types of knowledge play an important role in narrative construction of the client's self-narratives taking place at the therapy session in psychoanalytic psychotherapy. In our study we show how shifting of narrative perspective (NP) can be used as a tool for moving and navigating among different memory types within the autobiographical memory system. We also illustrate how such movement and navigation may be fostered by the analyst's interventions, more specifically, how rewriting of autobiographical memories may be influenced by the analyst's shifting perspective in his/her own talk. Methods: Our excerpts of therapeutic interaction are drawn from the Budapest Psychotherapy Database, a collection of transcribed psychoanalytic sessions recorded between 2004 and 2006 in Budapest, Hungary. The data is transcribed in the CHILDES coding system. Results: We qualitatively analyze examples selected from the data base to illustrate how different types of perspective shifts allow for navigating among memory types within the autobiographical memory system. Conclusion: NP shifting is an important aspect of psychoanalytic interventions. The study was supported by NKFI PD 108868.

Key words: autobiographical memory, narrative perspective, psychoanalysis, discourse

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## **The ability of interpreting others' intent in dogs**

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*Szilvia Tóth, Szent István University, Hungary*

*Ádám Miklósi, Eötvös Loránd University, Hungary*

The most basic prerequisite for any social behaviour is that individuals recognise each other and are able to engage in interactions. The recognition of others has two steps: (1) identification (conspecific, predator etc.) and (2) the representation of the other's goal and intent, as well as predicting the possible outcome of the interaction. The recognition of "intentionality" is a complex skill which serves as a means to attribute intention to an agent in novel situations. We hypothesise that this cognitive skill forms during ontogeny as the specimen experiences that others are capable of goal-oriented behaviours and these experiences amount to the skill of intentionality-attribution. In the present study we used an unidentified moving object (UMO) as social partner toward

which intention recognition can be developed de novo and we investigated whether dogs initiate interaction with the UMO after having specific experiences with it (the UMO helps the dog in different ways e.g.: protects the dog from a threatening person). In the Control Group the UMO did not help the dog (behave mechanically). Preliminary result show that dogs approach the UMO earlier in a problem-solving task if the UMO helps them during previous interactions.

Key words: intentionality, dog-robot interaction

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### **Do dogs use emotional expressions to infer preference?**

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From previous studies we know, that dogs are able to recognize referential human emotional expressions, they show preference for positive human emotions (happiness), and avoid objects marked by negative one (disgust). It is highly likely that dogs base their choice on the associations formed over their lifetime, as the owner's happy emotion often means something good for them. However, it is unclear what dogs choose when the owner's preferred object differs from their own preference, i.e. whether dogs are able to recognize humans' desires despite the dog's own preference. In the present study we tested dogs (N= 51) in a two way object choice test, with two type of objects. Owner showed happy emotion toward a bracelet and disgust toward a dog toy, the preferred object by the dog. In the control group the preferences were matched, the owner preferred the dog toy. The results showed that although dogs preferred the dog toy and not the bracelet in both groups, in a trial where contact with the objects was blocked, individuals who looked more at their owner in the experimental group looked more at the bracelet than at the dog toy. Based on this we conclude that dogs who are ready to maintain eye contact with their owners, show signs of recognizing the desire of their owner.

Key words: dog, emotion recognition, object choice test, desires

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## **Sweet delusion: no effect of glucose consumption on self-control depletion**

*Florian Lange, Hannover Medical School, Germany*

Initial acts of self-control have repeatedly been shown to reduce individuals' performance on a consecutive self-control task. Studies exploring the physiological basis of this effect have suggested that glucose consumption can counteract self-control depletion, both in humans and in dogs. Based on these results, glucose has been concluded to fuel the ability to exert self-control. I argue that at least three lines of evidence cast doubt on this so-called glucose model of self-control. First, physiological studies show that the influence of self-control tasks on brain metabolism is negligible. Second, using meta-analytical techniques it can be demonstrated that the evidence supporting the glucose model is highly implausible. I present results suggesting that the effect sizes reported in the literature are substantially inflated by publication bias or the use of questionable research practices. Third, a number of high-powered studies failed to replicate the original effects. Here I report results from three human experiments that did not find any influence of glucose administration on self-control depletion in the domains of temporal discounting and inhibitory control. In sum, the glucose model of self-control can be concluded to be untenable. Broader implications with regard to the replicability crisis and possible solutions are discussed.

Key words: self-control, temporal discounting, inhibition, glucose, replicability

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## **14-month-olds anticipate others' actions through belief attribution in an unexpected-identity task**

*Frances Buttelmann, Central European University, Hungary*

14-month-olds were tested in an unexpected-identity eye-tracking task. Infants saw movies displaying an experimenter (E) and an occluder with two holes, through which she could reach one object out of two. An assistant (A) showed a deceptive object (e.g., a spoon looking like a frog). While in the false-belief condition (FB) the actor was absent, in the true-belief condition (TB) she was present, when A revealed the object's real identity. Afterwards A placed one object resembling the appearance of the target and one object resembling the true identity in front of holes. When the holes light up we measured infants' anticipatory look towards one of the two objects. For correct anticipations, infants needed to understand that when E did not know that the frog was a spoon (FB) she would reach for the frog. However, if she knew about both the object's appearance and identity (TB) she might reach according to either. Infants anticipated E's reach according to her belief about the object's identity across the four trials in FB,  $t(21)=2.45$ ,  $p=.023$ . However, in TB infants performed at chance  $t(13)=0.0$ ,  $p=1.0$ .

These results suggest that as soon as infants represent dual-identities (Cacchione et al., 2013) they integrate them in belief-attributions.

Key words: Theory-of-mind, unexpected-identity, false belief

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### **Spatiotemporal individuation is harder for infants when presented with animated displays compared to live demonstrat**

*Gabor Brody, Central European University, Hungary*

*Csibra Gergely, Central European University, Hungary*

Infants' ability to individuate physical objects based on spatiotemporal cues is well established in the literature, and supported by evidence from habituation (Spelke and Kestenbaum, Simons and Wein, 1995) and familiarization (Xu and Carey, 1996) paradigms. In these studies when infants saw objects emerge from behind two spatiotemporally separate occluders sequentially they recognized that there had to be two objects present: even when the two objects are never shown simultaneously before test. So far the relevant reports used live demonstration (Spelke et al, 1995; Xu and Carey, 1996) or prerecorded video (Kuhlmeier, Bloom, and Wynn, 2005). In contrast we will report two studies where 10-month-old infants were presented with the same kind of scenarios but using 3D animated displays. Using Bayesian analyses we infer that infants in these studies were not able to use spatiotemporal cues for object individuation. We will discuss these results in terms of how different methodologies can affect individuation processes.

Key words: Object Individuation, infant cognitive development

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### **Effects of labels and visual similarity on categorization in 9-month-old infants**

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*Gert Westermann, Lancaster University, United Kingdom*

*Eugenio Parise, Lancaster University, United Kingdom*

Object categorization is an important aspect of cognitive development. Infants can form object categories in different ways: by grouping together objects that share common visual features, or by grouping objects that share a common label. This study aims to answer the question what happens when visual similarity and common labels are in

conflict with each other in a categorization task. We designed an experiment where visual features of objects suggested the separation into two groups, but the verbal labels we taught to the participants suggested a different grouping. We tested 15 9-month-old infants with an EEG category oddball paradigm, where the oddball could occur either by considering visual similarity or by considering the shared label. Infants showed an alpha desynchronization (a signature of category oddball detection) only when they were presented with the label oddball, but not when they saw the visual oddball. However the visual oddball led to a P300 ERP component, indicating that infants also encoded visual similarities. These findings show that preverbal infants can use labels to form categories that override visual similarities and suggest that labels may act as the basis for the formation of more abstract concepts.

Key words: cognitive development, object categorization, visual similarity, verbal labeling, EEG

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### **Extremely low birthweight infants; gender differences in developmental quotient**

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*Anett Nagy, Eötvös Loránd University, Hungary*

*Anna Beke, Semmelweis University, Hungary*

*Renáta Cserjési, Eötvös Loránd University, Hungary*

Introduction: Studies on long term neurodevelopmental outcomes in children born preterm with extremely low birth weight ( $\leq 37$  gestational age and birth weight  $\leq 999$  g) without serious neurological complications have found deficits in various neuropsychological domains such as intelligence, language skills and attention. However, there are still no consensus on (i) whether and if yes, up to what age developmental quotients score (DQ) should be corrected for prematurity and (ii) which DQ cut-off score should be used for clinical referral. Some of the today's (Hungarian) practices have set cut-off score for referral at  $DQ \leq 85$  corrected age, while some others have suggested cut-off score at  $\leq 100$ , but without considering gender differences. Thus, first it is important to study to what extent corrected and not corrected DQ may change the prevalence of preterm children at risk. Second, to examine which cut-off score would fit the best for the early diagnostic tool in order to identify those preterm children who should be involved in professional follow-up and early intervention. Aim: To identify the number of children qualified for further follow up depending on the use of corrected and non-corrected data within an established DQ cutoff score of  $\leq 85$ . Second, to explore if there are DQ gender specific cut-off scores for referring for further follow-up at the age of 1 based on the DQ results at the age of 2. Methods: Comparing retrospective data from the Brunet-Lezine Test of 185 preterm children born with extremely low birthweight  $\leq 999$ g (Females N= 111, Males N= 74)

tested at age 1 and 2 years. Gender differences, perinatal factors and mother. Findings: Our findings point to the direction that gender, Apgar Score after 5 minutes and mothers educational level have significant impact on corrected DQ and non corrected DQ scores as well. Female infants have higher DQ scores than male infants on all sub-scales, and up to 10 point higher score on global DQ both in corrected and non corrected for age. Without correction for prematurity at 2 years of age, and with cut off set at  $DQ \leq 85$ , we identified an increased number of children at risk, as 54 children (non-corrected for age) qualify for further follow up compared to 20 children (corrected age). Male infants seem, according to our findings, to be a more vulnerable group than female infants, as male infants constitute the highest number for being at risk regardless of DQ cut-off is set at  $DQ \leq 70, 85$  or 100, for both corrected and non-corrected age.

Conclusion: DQ correction for prematurity can encumber to identify problematic children at very early age (1 and 2 years old). Cut-off score varied in function of gender, the best fit cut-off score was different for the group of female infants than for the group of male infants. Thus clinicians should reconsider first to correct for prematurity the scores of developmental screeners, second to use gender specific cut-off scores for referral since a very early age.

Key words: preterm, extremely low birthweight, developmental quotient (DQ), corrected age

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## Session III.

### **Distinct developmental expression of phosphorylated tau in Down syndrome brains**

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*Ivan Milenkovic, Medical University of Vienna, Austria*

The concept of our research is based on the link between disorders of neural development and age-related neurodegeneration. As the population is becoming older, we are facing a big number of demented patients with serious cognitive impairments. Previous research showed that individuals with Down syndrome (DS) develop early Alzheimer's disease (AD). The hallmark of AD is deposition of misfolded tau and A $\beta$  proteins. Interestingly, pathologic phosphorylation of tau protein is reported to be transiently present in the normal developing brain. Thus, our aim was to compare the phosphorylation of tau proteins during normal development and individuals with DS. Our hypothesis was that phosphorylation of tau is changed in DS individuals which then occurs early in their adult life in form of pathologic phosphorylation. We compared the patterns of tau phosphorylation in the hippocampus (which is essential for navigation and different memory functions, including spatial and declarative memory) and in the cerebellum (motor learning) of 42 fetal cases diagnosed with DS and 42 age-matched cases of normal brain development. After immunohistochemistry, we precisely inspected the scans of glass slides for the density of immunoreactivity (IR-density) of 6 antibodies, either phosphorylation dependent (AT100, AT270, AT180 and AT8) or independent (HT7 and polyclonal anti-human tau antibody). We distinguished different immunostaining patterns as also changes in the spatiotemporal distribution of tau immunoreactivities in DS individuals and controls.

Key words: Tau, memory, neurodegeneration, development, phosphorylation;

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### **A novel food experiment reveals model-based biases in social learning in a wild population of vervet monkeys**

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*Andrew Whiten, University of St Andrews, Scotland*  
*Erica van de Waal, University of Zurich, Switzerland*

Recent research with both wild and captive primates has shown a number of biases in whom individuals socially learn from. This study aimed to experimentally test these biases, and particularly whether a dominance-based bias was present, in a wild population of vervet monkeys (*Chlorocebus aethiops*). Using a novel methodology, we

trained a dominant and low-ranking female from each of three groups (n=110) at opposing novel food colour preferences. Females demonstrated their preference 50 times, with audience identities recorded. Wald chi-square tests revealed significant differences in the composition of the audience between high and low-rankers, in terms of audience rank, kinship and social networks ( $p < 0.05$ ). A trend towards copying the dominant female's choice of colour was revealed in the test phase, becoming significant when kin of the models were removed from the analysis (binomial test,  $n=38$ ,  $p=0.034$ ). Whilst food colours were counter-balanced, a natural food preference may still have affected the results. Whilst providing evidence for a weak dominance bias, these results also highlight the roles of kinship and social network in social learning in a wild primate population, which should be considered when testing captive populations. This study was supported by a grant from the John Templeton Foundation.

Key words: vervet monkeys; directed social learning; field experiment; dominance bias

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### **Sapiens: the only ape with vocal learning**

*Joana Rosselló, University of Barcelona, Spain*

The emphasis on recursion/merge has made us overlook the role of words in language and, in particular, a crucial ingredient on which they rely in ontogeny and phylogeny, which is vocal learning (VL). Words are an invention which presuppose an innate capacity for both merge and VL - transposed into sign in deafness. Words, by being literally represented in our brains, call into question the divide between culture and nature. Seeing VL as the platform on which words and language are built allows us to eliminate dichotomies (internal vs. external, individual vs. social, thought vs. communication), understand the neural correlates for language, explain the integrative relation of speech and gesture - the latter with precursors in great apes, and to reduce exceptions: Sapiens is the only species with language since it is the only primate with VL.

Key words: Vocal learning, words, language, communication, cognition

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## **Vocal Imitation of Conspecific Sounds and Human Speech in the Killer Whale (*Orcinus orca*)**

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*Victoria Hernández-Lloreda, Universidad Complutense de Madrid, Spain*

*Francisco Aboitiz, Universidad Católica, Chile*

*Fernando Colmenares, Universidad Complutense de Madrid, Spain*

*Josep Call, Max Planck Institute for Evolutionary Anthropology, Germany*

Vocal learning in cetaceans has been reported for bottlenose dolphins (*Tursiops truncatus*) and recently for belugas (*Delphinapterus leucas*). Although previous observational evidence suggests that killer whales (*Orcinus orca*) are capable of vocal learning, the extent of the capacity for vocal imitation in this species has not been investigated experimentally. In this study we tested vocal imitative learning of sounds emitted by a conspecific and by a human in one killer whale. We used a 'do-as-I do' paradigm where the subject first listened to a conspecific demonstrator's performance that included 3 familiar and 5 novel sounds, and was asked to copy. The sounds were presented in two formats, performed by a killer whale model and played through a speaker. Then the subject also listened to 3 familiar and others 5 novel sounds, but now they were produced by a human demonstrator. The subject reached to copy all vocalizations emitted by both conspecific and human models for both familiar and novel sounds. This study provides experimental evidence for vocal learning imitation, including vocal production imitation in killer whales. The findings suggest that imitative learning may underpin some of the group-specific dialects through a process of cultural transmission reported in killer whales in the field.

Key words: vocal imitation, vocal learning, social learning, animal culture, killer whales

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### **Probability effects in perceptual decision making across species**

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*Gregor Rainer, University of Fribourg, Switzerland*

*József Fiser, Central European University, Hungary*

Studies investigating past influences on perceptual decision making usually focus on the recent past (priming, adaptation, sequential effects). However, not only the immediate past, but also stimuli from many trials ago can influence perceptual decisions. In a set of studies with humans (N=120) and rats (N=8), we investigated the role of past stimulus probabilities on visual discrimination. We wanted to test, whether in forming their expectations about upcoming visual stimuli, are people and rats simply

primed by recent probabilities or are they sensitive to how these probabilities differ from long-term experience. In a sequential forced choice task, the probabilities of stimuli appearing was manipulated over time at varying noise levels. We have found, that both long-term and recent probabilities influence choice preferences for both species. After experience with equal frequency stimuli, when the probability of a stimulus was suddenly increased, both species preferred rare stimuli in their answers. This effect is not the consequence of solely the previous few trials or a spontaneous preference for alternating answers, but shows a general tendency to compensate large probability shifts. In summary, comparing recent probabilities to long-term experience could be a basic mechanism of perceptual decision making, which generalizes across species.

Key words: vision, decision making, statistical learning

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### **An ethological approach to social evaluation**

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Social evaluation is a mental process underlying the avoidance of antisocial individuals (negativity bias) and preference toward prosocial partners (positivity bias) in cooperative context. Due to its significant effect on survival negativity bias is likely to be widespread among animals; however, we suggest that positivity bias may emerge only in specific social environments considering the smaller cost involved. We argue that negativity and positivity bias emerge independently and evolve later to a unified behaviour and cognitive system referred to as social evaluation. The ability to discriminate between others based on their prosociality has been investigated mainly in human and non-human primate species and dogs; however, there are a few data on the presence of negativity/positivity bias in client-cleaner reef fish interactions as well. Unfortunately, comparative approach to social evaluation is hindered by procedural differences in experimental studies, although these could facilitate the investigation on its evolutionary origin. Our aim is to present a general framework that can facilitate future comparative research on the topic that may reveal that the capacity for social evaluation is not restricted to humans alone, but it is likely to be more widespread in the animal kingdom.

Key words: social evaluation, negativity bias, positivity bias, comparative psychology, cognition

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## **Evolution of the red panda (*Allures fulgens*) and the family Ailuridae**

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Everyone knows the giant panda. Thanks to the late Stephen Jay Gould it has gained worldwide recognition and became something of a “superstar” in evolutionary researches and the animal conservation field. Meanwhile there is another lesser known, but not less interesting panda, the red panda. In fact, the red panda was discovered by the Western culture about 50 years before his giant homonym. The most intriguing part about the two pandas’ relationship is that they are not related, as wrongly thought before, but their similarities are a result of convergent evolution. Both animals had to adapt their carnivore behavior and digestive system to an herbivore lifestyle during their evolution, and ended up sharing the same niche in the temperate bamboo forests of the Himalayas. In my poster I will be focusing on the evolution of the red panda (*Ailurus fulgens*). How the Ailuridae family transformed from hypercarnivorism, what cognitive and anatomical changes (for example the pseudo-thumb) they had to go through and how this knowledge will aid us to better conserve this magnificent species both in captivity and in the wild. In my presentation I will be using husbandry and mortality information from European zoos, to investigate the relationship between alimentation, management of the animals and their survival rate in zoos. “Zoos are changing their function...to heavens of preservation and propagation...an animal outside its historical place loses more than a home” Stephen Jay Gould, 1987.

Key words: convergent evolution, adaptation, conservation, zoo

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## **Sound and syllable discrimination in stroke patients with severe comprehension disabilities as reflected in mismatch negativity (MMN)**

*Karolina Lice, Polyclinic SUVAG, Croatia*  
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Mismatch Negativity (MMN) is an ERP component usually interpreted as a trace of auditory stimulus discrimination without the participants attending to it. It is thought that MMN reflects the earliest, and "low level" processes, e.g. frequency, time, and phonemic differences. Some studies have shown that shorter latency, longer duration and larger peak amplitude implied better discrimination. Absent or reduced MMN amplitude is often recorded in aphasic patients, especially those with severe comprehension deficits. Many studies show that absence or reduction of MMN is associated with lesions involving temporal lobe. The aim of this study is to study changes in MMN at different levels of auditory processing. For that purpose two oddball

experiments have been done on patients with severe comprehension deficits (n=10) and their age controls (n=10). The first experiment varied between a frequent tone (1000 Hz, 50 ms duration), a rare tone with a longer duration (75 ms) and a rare tone of a higher frequency (1100 Hz). The second experiment varied between a frequent syllable ('ba') a rare syllable ('ga') and a rare syllable ('pa'). One rare syllable thus differed in the place and the other in the manner of articulation. In both experiments the ratio between the frequent and the rare stimuli was 70:15:15. Results have shown that both groups of participants produced MMN in the first experiment, with a more pronounced MMN in duration condition than frequency condition. Peak amplitude was lower, duration was shorter and the scalp distribution different (more frontal and right) in the aphasic group. In the second experiment only control participants elicited MMN and just for the 'pa' condition (manner of articulation). There were no MMN in aphasic group, neither for stimuli that differ in the place nor for the stimuli that differ in the manner of articulation. These results indicate that the comprehension deficit at the "higher" level of language processing could be explained by some specific phonemic or phonological deficit at the "lower" end of linguistic processing while the auditory, non-linguistic mechanisms might not be involved.

Key words: aphasia, stroke, comprehension disabilities, sound and syllable auditory discrimination, ERP, MMN

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### **Selective Imitation of Culturally Knowledgeable Informants in 3-year-old Children**

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Children from an early age selectively acquire information from knowledgeable individuals. In this study, we tested whether 3-year-old children would be more willing to accept information from someone demonstrating competence in the ways of their own culture than from someone who gives evidence of having different cultural habits. Participants (n=30) were first presented with videos of two models performing simple tool using actions. One of the models performed the actions in the manner that children are accustomed to (e.g. using a fork to eat), while the other one violated the cultural norms (e.g. using a fork to brush hair). In the test phase, children watched both models demonstrate a target action with one step performed differently by the two models. Children were then allowed to reproduce the actions and choose the variant they preferred. We found that the majority of children who incorporated the altering step into their own actions (n=22) imitated the step that was introduced by the conventional tool user (n=15). The results suggest that children are sensitive to the boundaries of

shared knowledge and prefer to learn from those who show evidence of being knowledgeable in the ways of their own culture.

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**Infants are efficient learners, selecting the optimal source and optimal type of information to learn**

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Infants exhibit an early emerging tendency to select who they want to interact with, and attend to, based on a variety of different behaviours, such as language or competency. We propose this social selectivity reflects infants' motivation to obtain information from the optimal source, whereby infants actively direct their attention to social partners, who are most likely to provide them with culturally-relevant information. Furthermore, we propose that if infants were efficient active learners, their motivation to learn would lead them not only to select the optimal source, but also to select the optimal information - that is information, which allows broadest generalization to other contexts. We recorded EEG theta oscillations during infants' anticipation of information. Theta oscillatory activity has been shown to predict the degree of learning and, importantly, anticipatory theta activity is believed to reflect an active preparatory state, reflecting participants' motivation to learn. In a series of 4 studies, we have shown that 11 and 21-month-old infants show greater theta activity when they can expect to receive information from the culturally-relevant social partners, and greater activity for partners providing generic over item-specific information. Combined, these studies provide further evidence that infants are active, selective and efficient learners.

Key words: social learning, infants, selectivity, genericity

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## **Is It a Bird? Is it a Plane? - Detection of biological motion by Western scrub-jays**

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*Nicola S. Clayton, University of Cambridge, UK*

Western Scrub-jays take into account what others can see and hear when protecting their hidden caches from potential pilferers, suggesting that they may have Theory of Mind-like abilities. In humans, the ability to detect biological motion precedes the development of Theory of Mind and may be an important prerequisite for it. Human infants attend to point-light animation sequences depicting human movement from an early age, preferring it to sequences depicting non-biological, random movement. In this study, we addressed the question of whether or not Western scrub-jays would show a similar preference to observe biological motion patterns compared to a random motion pattern. Birds had access to two peepholes, allowing them to choose between random motion and three different types of biological motion patterns: a biological motion of another scrub-jay (Experiment 1), a familiar biological motion pattern of a cat walking (Experiment 2) and an unfamiliar biological motion pattern of a horse (Experiment 3). Across all three experiments, scrub-jays did not reliably prefer to observe biological motion. One interpretation is that a preference for biological motion patterns might not be associated with Theory of Mind-like abilities in scrub-jays.

Key words: Western scrub-jays, social cognition, Theory of Mind, biological motion perception

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## **Competition and cumulative culture: the monster game**

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The role of competition as a driver of cumulative culture was explored using a competitive game played between laboratory groups of adult humans. This game requires coordination, social learning, and innovation. Participants must populate a team of monsters from a given league. They play two rounds, one in which team and league size is set at 5 and 24 respectively, and a more complex round with team and league size of 6 and 48. Monsters each had a hidden score, and some monster interaction pairs led to a large bonus or cost to the team's score. Participants could improve performance by identifying the game rules concerning scores and interactions between monsters. In this experiment, we manipulated competition (within or between group), as well as strategy (e.g. asocial, copy the best/majority). Different strategies lead to different information sharing between and within groups. We examine cumulative culture as expressed by success in playing the game. We found that

between group competition led to an increase in social learning within groups, and thus led to an increased score for groups. Future research will explore the role of exchange of individuals and knowledge between groups on cumulative culture.

Key words: cumulative culture, social learning strategies, competition

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### **Working memory capacity, school achievement, and physical fitness: A latent variable analysis**

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The relationship between working memory capacity (WMC), educational aptitudes, and school achievement is well established. Also, there are individual results demonstrating a link between WMC and physical activity. Our goal was to investigate the relationship between these constructs using structural equation modelling on a large sample (N = 428) of students (14 and 18 year olds). Participants completed five working memory tests online: Corsi (both forward and backward), Digit Span Test (forward and backward) and the N-back Test. We obtained students' academic grades in maths, Hungarian language and literature, and in English as a foreign language; their PISA competency scores for mathematics and reading comprehension; and the result of the National Unified Student Fitness Test (NETFIT). We have found a moderate relationship between WMC and educational measures. Interestingly, the raw correlations of tasks measuring WMC were higher with PISA scores than with school grades. We have also found a weak relationship between physical fitness and WMC. Interestingly, a few individual measures of physical activity were more strongly related with the cognitive and educational measures than others. Our results replicate previous findings about the relationship between WMC and educational achievement with an additional and theoretically interesting link to physical activity.

Keywords: working memory capacity, school achievement, PISA, physical fitness

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## **Association between the variants of the oxytocin receptor gene and gaze following behaviour in human infants and adult dogs**

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Increasing evidence indicates that the neurohormone oxytocin plays a significant role in both dogs' and human infants' social-communicative receptivity. The aim of this study was to investigate the association between gaze following ability and the different variants of the oxytocin receptor (OXTR) gene in a comparative manner. Adult pet dogs (Border collies from Hungary and Austria, N=129 altogether) and 18-month-old human infants (N=120, all Hungarians) participated in a two-way object choice situation in which an unfamiliar woman established eye contact with the dog/infant and then turned her gaze towards the hiding location. DNA samples were also collected and subjects were genotyped for 1-1 single nucleotide polymorphism (SNP, rs53576 for infants; -74CG for dogs) in the OXTR gene. Results show significant associations between the selected SNPs and subjects' tendency to follow human gaze in both dogs and infants. In dogs, however, the association was confounded by the rearing condition as there was a significant interaction between the country of origin and the effect of OXTR SNP on gaze following behaviour. These findings raise the possibility that susceptibility to human social signals is affected by the allelic variations of oxytocin receptor gene in both dogs and infants. (Supported by OTKA K-112138.)

Key words: oxytocin, gaze following, infants, dogs

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## **Determining emotional value of photograph stimuli**

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The present study (N = 130) is based on the need to create a new database of photograph stimuli balanced regarding the content of the emotional stimuli as well for color, size, luminosity, contrast, and quality of photographs, which are uneven in existing databases. This would allow manipulating factors of interest for emotional processing without interfering perceptive or content elements placed on photographs. We aim to evaluate the effect of rule of thirds, roundness and color on the emotional value of the stimuli. Factor of the picture content was controlled by comparing only photographs of landscape taken for the purpose of this study. We expected rule of thirds, roundness, and color to affect the assessment of emotional valence, arousal, and dominance. Colors and rule of thirds of all photographs were manipulated and the 2x2x2 within-subject design was analyzed. As expected, photographs with rule of thirds applied, curved lines, and in full color spectrum, were evaluated as more

pleasant as main effects, and the interaction effect for color and curve was significant. Grayscale photographs were surprisingly evaluated as less dominant. In line with our expectations, photographs with predominantly angular lines and grayscale individually were perceived as more arousing.

Key words: emotional value, photographs, landscape, emotional processing, perception

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### **A new experimental approach probes cultural innovation and transmission in young children**

*Lewis Dean, University of St Andrews, UK*  
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*Vanessa Burgess, University of St Andrews, UK*  
*Amanda Lucas, Exeter University, UK*  
*Daniel van der Post, University of St Andrews, UK*  
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Human culture is uniquely complex, with cumulative increases in technology occurring over generations. This results in products too complicated for any one individual to produce alone. Researchers interested in the evolution and development of cumulative culture have attempted to replicate cultural ratcheting 'in vitro' by examining how groups of animals make small-scale improvements to their behaviour to gain better rewards. This experiment expands that methodology, applying it to a rich cultural world, more reminiscent of the complex cultural environment of humans. The 'small worlds' apparatus offers four different exits, at four increasingly difficult levels, which can be manipulated with a number of different tools. To test cumulative culture over 'generations' a replacement transmission chain was run with four-five year old children (n=66). One child, of a group of three, was replaced every five minutes until an entirely new group of children was present, with each chain run for 20 minutes. While there is no evidence for cumulative improvements along the chains, there was success at more complex levels in some chains. There is also evidence of strong cultural differences between groups (Mann-Whitney,  $p= 0.0054$ ), suggesting this novel and complex approach may enable us to explore children's social learning 'in the wild'.

Key words: Cumulative culture, innovation, social learning, culture, transmission chain

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## **Theory of mind abilities in patients with borderline personality disorder and major depression: a meta-analysis**

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Patients with major depression (MD) and borderline personality disorder (BPD) are characterised by a distorted perception of other's intentions. Deficits in theory of mind are thought to be the underlying cause of this feature. Human facial cues of the eyes provide one of the most important signals of intact theory of mind. Nevertheless, a systematic review of 13 cross-sectional studies comparing Reading in the Mind of the Eyes Test (RMET; Baron-Cohen et al., 2001) accuracy and emotion valence performance of patients with MD or BPD and healthy controls ( $n = 976$ ) was undertaken. Large significant deficits were seen for global RMET performance in patients with MD ( $d = -0.751$ ). The positive RMET valence scores of patients with MD were significantly worse; patients with BPD had worse neutral scores. Both groups were worse than controls. Moderator analysis revealed that individuals with co-morbid BPD and MD did better than those with just BPD on accuracy. Those with co-morbid BPD and any cluster B or C personality disorder did worse than BPD alone. Both BPD and MD patients performed better than those with BPD without MD for positive valence. Results show how to address theory of mind impairments in these populations.

Key words: Theory of Mind; Mental States; Major Depression; Cognitive; Borderline Personality Disorder

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## Session IV.

### **Different Eyes but Similar Processing? Visual cognition in the jumping spider**

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*Lucia Regolin, University of Padua, Italy*

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MicroMegaMondo of Butterfly Arc, Italy*

Providing convincing evidence in favor of cognitive behaviour sometimes constitutes a real challenge, this is particularly true when the subject is an invertebrate. An exception may be the jumping spider (Salticidae), as these species make a very good model of investigation, already acknowledged in the literature for spatial cognition (Tarsitano et. al., 1997), learning (Jakob et. al., 2007) and decision making (Cross et. al., 2014). We use a double choice paradigm to assess the ability of *Phidippus regius* to discriminate between two shapes, such as a triangle and a square, with the purpose of testing if they are able to see a triangle in the Kanizsa illusion. We believe in fact that in spite of a very focal vision (Menda et. al., 2014) these animals could compute images through configural processing, allowing for amodal perception, as already demonstrated for species endowed with camera (Vertebrates) or with compound (Insects) eyes. Preliminary pilot tests were run on adult individuals with encouraging results. Experiments on shape discrimination are currently ongoing on F1 (male and female) juveniles and the first novel data will be discussed.

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### **Frequency of occurrence facilitates phonological structures learning**

*Mirta Zelenika, University of Zagreb, Croatia*

The aim of this research is to examine the neuropsychological correlates of processing events with different phonotactic probabilities by using statistical learning paradigm. Distributional frequencies of phonemes in words are typically referred to as phonotactic probabilities and acquisition of these regularities is achieved through their structured presentation. This form of learning is called statistical learning. This study was carried out within the project Interdisciplinary approach to the development of language and cognitive model of dyslexia in adults (HR.3.2.01-0247). Ten graduated students participated in this study. Stimuli were comprised of disyllabic pseudowords CCV-CV structure. In the exposition phase participants were presented with high and low phonotactically probable stimuli. The first syllables in each group of pseudowords were equiprobable, while the second syllables occurred with either low (20%) or high (80%) probability. Compared to high frequency of occurrence, high phonotactic probability

pseudowords with low frequency of occurrence elicited an early anterior negativity that had onset on the second syllable of pseudowords. Participants had longer reaction times and more errors for low frequency stimuli and "ungrammatical" stimuli in condition where syllables were in combinations that participants did not hear before. Both behavioral and electrophysiological results suggest high impact of frequency of occurrence and its relevance in phonological structures learning.

Key words: statistical learning, phonotactic probability, MMN  
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**Same versus foreign language use by ostensive demonstrators influence the likelihood of correcting over-imitation in preschoolers**

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*Mikolaj Hernik, Central European University, Hungary*  
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*Gyorgy Gergely, Central European University, Hungary*

Here we explore the hypothesis according to which the phenomenon of over-imitation is a consequence of children's preparedness to learn culturally relevant information from reliable epistemic sources. We test whether same- versus foreign-language use in ostensive demonstration contexts modifies preschooler's evaluations of the degree of epistemic trust in different sources of information, by exploiting an over-imitation paradigm originally used by Hoehl et al. (2015). Four and 5-year-old children (N = 36) first saw an agent, speaking the same language with them (or a different agent speaking a foreign language), retrieving a sticker by performing superfluous actions on a puzzle-box. Later they saw the foreign-language-user (or the same-language user) retrieving a sticker from the same box by performing the relevant action only. Children had two reenactment phases after viewing each demonstration. Our preliminary results show that they were equally likely to learn from both sources, independent of the language two demonstrators spoke with. However, upon later seeing the relevant-action-only demonstration children reduced their over-imitation behavior but only if this demonstration was done by the same-language user. These findings suggest that children's willingness to modify the learned content on the basis of a potentially corrective second demonstration is influenced by the shared versus non-shared language of the demonstrator.

Key words: learning, over-imitation

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**Abilities of recognize and to produce sequence of movements: how they are necessary for purposeful behaviour**

*Olga B. Sizova, Russian Academy of Sciences, Russia*

In a study the two types of SLI children with problems of speech production are discussed in relation to the formation of the cognitive processes of categorization and purposeful behavior. It based on longitudinal observation 19 Russian preschoolers and demonstrates that children with primary somatosensory dysfunction (PSD) begin to build their communication within the framing of requesting grammar (with pantomime), children with primary kinetic dysfunction (PKD) - with pointing within the confines of informing grammar (Tomasello). Wherein, PSD children are experiencing problems with the formation of categorization. In PKD children marked propensity to over-imitation and problems of formation of purposeful behavior. A study investigates with referring to concept of image schemas (Lakoff), how the primary disorders of general biological abilities to recognizing or to producing sequence of movement are lead to the formation of specific ways of interaction with the environment and therefore to features of the development of such cognitive functions, as a categorization or purposeful activities. The research was carried out with the financial support of the Russian National Foundation (grant 14-18-03668 "Mechanisms for the Acquisition of Russian and the Development of Communicative Competence at the Early Stages of Child Language").

Key words: SLI, categorization, purposeful behavior, typology of development

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**The role of sensory consonance in the detection of abstract rules: a comparison across species**

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Previous research on consonance, a salient perceptual feature in harmonic music associated with pleasantness, suggests that consonant intervals are more easily processed than dissonant intervals. In the present work we explore from a comparative perspective if this processing advantage extends to more complex tasks such as the detection of abstract rules. We ran experiments on rule learning over consonant and dissonant intervals with non-human animals and human participants. Results show differences across species regarding the extent to which they benefit from differences in consonance. Animals learn abstract rules with the same ease independently of whether they are implemented over consonant or dissonant intervals. In contrast, processing advantages for consonance over dissonance were observed in human participants. They learn an abstract rule better when it is implemented over consonant

than over dissonant intervals. Moreover, their performance improves when there is a mapping between abstract categories defining a rule and consonant and dissonant intervals. Results suggest that for humans, consonance might be used as a perceptual anchor for other cognitive processes as to facilitate the detection of abstract patterns. Lacking extensive experience with harmonic stimuli, non-human animals tested here do not seem to benefit from a processing advantage for consonant intervals.

Key words: consonance, rule learning, music, comparative cognition

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### **Just a matter of (cognitive) control? Insights from studies of false memories in the DRM paradigm**

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Vast amount of studies show people displaying naive tendency to trust their memory, e.g. by rating its accuracy considerably higher than they should. Apart from being an essential issue on experimental studies on memory and cognition, the problem of subjective certainty, reported by people as "sense-of-remembering" seems to remain significant issue itself, enabling to provide valuable information about human mind. To examine this phenomenon 3 studies were conducted (N=220). Main research question was to verify whether working memory executive-function efficiency affects false memory creation within extended version of Deese-Roediger-McDermott paradigm (lists of words related,1995). Experiment 1 was designed to examine relationship between participant's actual memory accuracy and feeling of remembering (measured by remember-know judgment;Tulving, 1985) to items that were (1) studied, (2) non-studied and (3) critical - strongly associated to studied, but not presented during experiment. Experiment 2 was dedicated to provide more precise feeling-of-remembering measurement and investigate connections to working memory. The aim of experiment3 was to examine affect depth of processing on a tendency to generate false memories in dependence of WM control quality. Findings revealed that individual differences in cognitive control ability impact tendency to generate false memories, as well as differentiate participants in respect of declared level of certainty to false recollections.

Key words: false memories, DRM, cognitive control, remember-know judgment, working memory

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## **Generalizing rules over clicks: Preliminary results**

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Consonants carry lexical information and are crucial for word identification, while vowels carry prosodic information and are associated with syntactic structure, crucial for grammar learning. Previous experiments have shown that subjects are able to extract rules over vowels, but not over consonants. We hypothesize that click consonants, by virtue of not being perceived as linguistic by speakers of languages that don't employ them, would not be treated as consonants, and therefore the constraints on the kind of information they encode would be relaxed. Following a well established paradigm, we tested our hypothesis by familiarizing participants with a stream of CVCVCV "words" made up of vowels and click consonants, the latter following an ABA pattern. Participants were then given pairs of items with new clicks, one that instantiated the rule and one that did not, and had to choose in each pair the item that most resembled the stream from the familiarization phase. Subjects did not choose items at random. However, they showed a slight preference for items that did not follow the ABA rule. Some possible explanations for this preference are provided, as well for the implication of the results to our hypothesis.

Key words: rule-learning, consonants and vowels, speech perception, click consonants

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## **Innovation and flexibility in chimpanzees in response to a changing foraging task**

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*Andrew Whiten, University of St Andrews, Scotland*

Innovation, behavioural flexibility and social learning are key factors facilitating cumulative culture. Recent studies suggest great apes may possess a greater capacity for behavioural flexibility than previously indicated. Semi-wild chimpanzees at the Chimfunshi Wildlife Orphanage, Zambia, (N=12) were offered an extractive foraging task (a tube partially filled with juice) and a selection of tool materials. Chimpanzees could access the device as a group. After 10 hours of testing, the tube was made narrower, restricting available solutions. After a further 20 hours of this restricted condition, frequently used tool materials were no longer provided, and the task was presented for a further 10 hours. Preliminary results indicate that chimpanzees flexibly

altered their choice of tool material in response to the change in tube width in line with success rates achieved using each tool material. Following observation of another individual attempting the task, chimpanzees were likely to match the technique or tool material observed. A subset of chimpanzees (N=4) used innovative composite tool techniques, and one individual modified these techniques when preferred materials were removed. These findings indicate that, under certain conditions, chimpanzees may be capable of the innovation and behavioural flexibility necessary to support the evolution of cumulative culture.

Key words: behavioural flexibility, innovation, social learning

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### **Using eye movements to investigate the automatic processing of other's desires**

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Traditionally, theory-of-mind (ToM) studies have used elicited-responses to measure an understanding of others' mental-states; however, there has been growing interest in spontaneous-response measurements such as anticipatory looking. While elicited-response false-belief tasks are not passed until 4-years-old, the anticipatory looking paradigm has allowed belief-attribution to be identified in pre-verbal children as early as 13-months-old. These infants possess the ability to automatically track others' belief-states; an ability potentially shared by non-human animals. If these anticipatory looking responses reflect a generalised automatic system for encoding others' mental states, they should also be sensitive to non-epistemic states such as desires. Desire-state attribution has been a key area for animal ToM research, and a non-verbal eye-movement-based indicator would be valuable for further investigation. However, we have found that spontaneous anticipatory-looking responses in adult humans did not reflect an understanding of others' changing desire-states. This lack of desire-state attribution at the sub-conscious level does not support a generalised automatic ToM-system, suggesting that previously identified spontaneous-responses may be specific to belief-states rather than a universal process. From this we conclude that spontaneous-responses are not as versatile as previously believed for studying ToM in children and animals, marking a possible change in direction for future comparative ToM research.

Key words: theory of mind, comparative, false belief, desires, anticipatory looking

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## **Abstract patterns learning in baboons**

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Learning of specific sequences of stimuli has been widely studied in comparative psychology. However, abstract pattern learning (i.e. extraction of the structure underlying the relationships between the successive elements of a sequence) received significant interest only recently. Crucially, a poor number of studies tested the ability of nonhuman animals to extract abstract patterns in an implicit learning task, and none reported the learning dynamics. In the current study we tested this ability in a group of baboons (*Papio papio*, n=22), using a serial reaction time task adapted to the presentation of sequences of visual shapes. Baboons were presented consecutively with two patterns: sequences of 2 and 3 shapes that took the form AA and ABA (i.e. repetition of the first element, immediately or after an intervening element). A decrease in response times on the repeated element was expected if baboons learned the pattern. For both patterns the baboons were faster to respond to the predictable shapes, compared to inconsistent sequences, and transferred this behavior to novel shapes. Interestingly, we observed important discrepancies between the learning dynamics of the two patterns at the individual level.

Key words: comparative cognition, nonhuman primate, statistical learning, sequences

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## **Revisiting the role of the hippocampus in vocal learning**

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In an attempt to correct for the marginalization of the hippocampal contribution to language proceeding, we would like to focus on the significance of hippocampal volume in vocal learners, and language-impaired individuals. We review evidence like Pohlack et al., (2014), where a significant positive correlation between lexical knowledge and hippocampal size, as well as hippocampal volume decreases in instances language acquisition delays (Williams syndrome) and mental disorders with language deficits (Alzheimer, Down syndromes). Among vocal learning birds, one also finds a correlation between hippocampal volume and open-ended song learning strategies. Species with relatively large hippocampi such as the European starling or the blackbird are able to memorize and rehearse new songs throughout life, whereas

songbirds like the Zebra finch, which exhibit relatively smaller hippocampi, are closed-ended learners.

Key words: Hippocampus, language, vocal learning, songbirds.

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### **Do monkeys compare themselves to others?**

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*Thomas Mussweiler, University of Cologne, Germany*

*Julia Fischer, German Primate Center, Germany*

Social comparisons are a fundamental characteristic of human behavior, yet relatively little is known about their evolutionary foundations. When comparing themselves to others, humans often assimilate to moderately different comparison standards and contrast away from extreme standards, e.g. with regard to self-evaluation judgments but also in co-action tasks measuring performance. We examined how the performance of a co-actor influenced subjects' performance in nine long-tailed macaques (*Macaca fascicularis*). Using parallel testing in touch-screen setups in which subjects had to discriminate familiar and novel photographs of men and women, we investigated whether accuracy and reaction time were influenced by partner performance and relationship quality. Performance was not affected by any of the factors, yet subjects performed better in a social control condition in the presence of an affiliate than a non-affiliate. Long reaction times occurred more frequently when subjects were tested with a non-affiliate who was performing worse, compared to one who was doing better than them. Subjects were sensitive to partner identity and performance, yet variation in motivation rather than assimilation and contrast effects may account for the observed effects. Whether this indicates different underlying mechanisms of social comparisons compared to humans or is an artefact of the experimental paradigm will be investigated in upcoming studies.

Key words: social comparisons, nonhuman primates, co-action paradigm

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## **Sex-specific utilisation of subtle cues in foraging bumblebees**

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An animals' sex can markedly affect its utilisation of environmental information. In bumblebees, males need to trade-off mate search and foraging, whereas foraging workers focus solely on flower exploration. Do the fundamentally different life-styles of male and worker bumblebees (*Bombus terrestris*) affect their ability to respond to subtle cues that may indicate reward or predation risk? We hypothesise that multi-tasking males are less acute learners on subtle cues than the 'single-minded' workers. In a differential operant learning task we used two saliently coloured feeder types half of which contained a superimposed transparent secondary cue. We tested free-flying males and workers for their ability to identify rewarding feeders using the secondary non-salient cue. Both sexes reached mean choice accuracies of over 80% after 200 visits. However, workers were on average 11% (max. 18.4%) more accurate when the subtle cue indicated reward as compared to the reverse test. Surprisingly, males responded much more cautiously to non-salient cues performing on average 9% better (max. 21.5%) when the reward was predicted by the absence of the subtle cue. We discuss the potential evolutionary drivers that may have caused these sex-specific foraging strategies and its implications for our understanding of bee cognitive behaviour.

Key words: bumblebee males, sex-specific behaviour, attention, visual learning, cue saliency

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## **Individual Differences in Performance on Iowa Gambling Task are related with personality traits of Risk Readiness and Rationality**

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Iowa Gambling Task (IGT) is used to index individual differences in decision-making under uncertainty. However, it is rarely analyzed as a learning task. Here, we focused on Risk Readiness and Rationality as two personality traits that could potentially influence subjects' IGT performance. Using General Linear Model analysis of experimental data (n=125, 5 blocks) we revealed significant effects for both traits and their combination with participant's sex. Individuals with higher Risk Readiness switched deck after a loss more often than individuals with lower scores on this scale.

Highly Rational individuals who demonstrates tendency to seek for information in decision-making process were able to win significantly more money during the game. Game strategy was also related to the level of Rationality: participants with higher scores on this scale increased the number of “good-deck” choices during the game more rapidly than those who had low scores. Thus our results argue with the main assumption about emotional regulation of decision-making process in IGT. We revealed significant impact of the trait of Rationality that taps into conscious efforts for gathering information about uncertain situation. This research was supported by the Russian Foundation for Humanities (RGNF), grant No15-06-10404a (PI: Smirnov).

Key words: Iowa Gambling Task, Risk Readiness, Rationality

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### **Stimulus equivalence in baboons: does categorization promote symmetry?**

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Humans have the capacity to use stimuli interchangeably by forming equivalence classes, and this competence is critically important for language skills. The formation of equivalence classes requires the emergence of three relations among class members, and past experiments have repeatedly demonstrated that one of these relations, symmetry, is extremely difficult for non-human animals. Because word learning, which requires the ability to form bi-directional associations between words and referents, concurs in children with an increased ability to form categories, this study explored the possibility that category learning might promote symmetry in a nonhuman primate species. In Experiment 1, twelve Guinea baboons (*Papio papio*) were trained to associate 60 exemplars of each of two different categories (e.g. flowers and houses) to their respective category labels, before being tested in symmetry trials. Experiment 2 used the same design with a new set of stimuli, but the association order between labels and pictures was reversed. In both experiments, and in spite of the high performance obtained in category learning, the baboons failed during symmetry testing. We discuss possible explanations for the inherent difficulty of symmetry for non-human species, and give reasons for thinking that the effects of categorization on symmetry should be further investigated.

Key words: Language, nonhuman primate, stimulus equivalence, symbol

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## **How to access others' minds? Using experience projection to test automatic processing of others' beliefs**

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Pre-verbal children and non-human animals have been hypothesised to possess the ability to automatically process others' mental states. Tests of this so-called automatic Theory of Mind (ToM) to date involve a false belief task based on an implicit measure, namely anticipatory looking towards a location that a protagonist is expected to reach for an object. However, it is not yet clear whether this implicit measure really tests an automatic processing of the protagonist's false belief or whether it is the result of domain-general processes. It has been proposed that support for the former hypothesis requires evidence that participants can use their own experience of a mental state to infer the protagonist's mental state. Here, we use this 'experience projection' paradigm to test whether human adults would use their first-hand experience of two types of goggles (one see-through, one opaque) to correctly look towards where a protagonist wearing the goggles would reach for an object. We will discuss what the adults' data can tell us about the validity of the anticipatory looking measures for testing automatic ToM in developmental and comparative psychology research.

Key words: theory of mind, anticipatory looking, experience projection

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