BCCCD 2018

Budapest CEU Conference
on Cognitive Development

PROGRAM
AND ABSTRACTS

CEU CENTRAL EUROPEAN UNIVERSITY

Labor Babakutató

	Thursday	Friday	Saturday
08:30	**Tobii Pro Workshop 1** Setting up combined eye-tracking and EEG *N15 103*	**Paper session 2** (starts at 9:00) Causal learning *N15 Auditorium*	**Invited lecture 2** (starts at 8:45) Reverse-engineering the core of human common sense *N15 Auditorium*
10:00	**Workshop Coffee break** *N13 Lobby*	**Coffee break** *N13 Lobby*	**Coffee break** *N13 Lobby*
10:30	**Tobii Pro Workshop 2** Analyzing co-registered eye-tracking and EEG data *N15 103*	**Symposium 2** The development of body representation *N15 Auditorium*	**Symposium 4** Where can predictive processing accounts of autism spectrum disorder take us next? *N15 Auditorium*
12:00	**BCCCD Welcome** (starts at 12:45)	**Lunch**	**Lunch**
13:00	**Symposium 1** New directions in studying trust *N15 Auditorium*	**Symposium 3** Comparative approaches to socio-cognitive development *N15 Auditorium*	**Symposium 5** Perceptual and developmental foundations of action-event representation *N15 Auditorium*
14:30	**Poster session A** with coffee & snacks *N15 1st floor*	**Poster session B** with coffee & snacks *N15 1st floor*	**Poster session C** with coffee & snacks *N15 1st floor*
16:30	**Paper session 1** Agency *N15 Auditorium*	**Paper session 3** Neuroimaging of Theory of Mind *N15 Auditorium*	**Paper session 4** Non-human Primate Cognition *N15 Auditorium*
17:30	**Invited lecture 1** The Resilience of Language and Gesture *N15 Auditorium*	**Invited symposium** Decision-making: from perception to social cognition *N15 Auditorium*	**Symposium 6** From Social to Moral: Children's evaluations of how people uphold their prosocial obligation *N15 Auditorium*
19:00	**Welcome reception** 18.45-21:30 *N13 Lobby*	**Mulled-wine reception** 19:15-20:30 *N13/N15 CEU Rooftop terrace*	**Gala dinner** 20:00-3:00 *Géllert Hotel*

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Program and Abstracts

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CONFERENCE ORGANIZATION

The BCCCD is organized by the Cognitive Development Center at the Department of Cognitive Science of Central European University: http://cdc.ceu.edu/

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INVITED PROGRAM

INVITED LECTURE 1

The Resilience of Language and Gesture

Thursday, January 4, 17:30-18:45

Susan Goldin-Meadow

University of Chicago, USA

Imagine a child who has never seen or heard any language at all. Would such a child be able to invent a language on her own? Despite what one might guess, the answer to this question is “yes”. I have studied children who are congenitally deaf and cannot learn the spoken language that surrounds them. In addition, these children have not yet been exposed to sign language, either by their hearing parents or their oral schools. Nevertheless, the children use their hands to communicate––they gesture––and those gestures take on many of the forms and functions of language. The properties of language that we find in the deaf children’s gestures are just those properties that do not need to be handed down from generation to generation, but rather can be reinvented by a child de novo. They are the resilient properties of language, properties that all children, deaf or hearing, come to language-learning ready to develop.

In contrast to these deaf children who are inventing a language with their hands, hearing children are learning language from a linguistic model. But they too produce gestures. Indeed, all speakers gesture when they talk. These gestures are associated with learning, they can index moments of cognitive instability, and they reflect thoughts not yet found in speech. Indeed, these gestures can do more than just reflect learning––they can be involved in the learning process itself. Encouraging children to gesture not only brings out ideas that the children were not able to express prior to gesturing, but can also teach children new ideas not found anywhere in their repertoire, either spoken or gestured.

Gesture is versatile in form and function. Under certain circumstances, gesture can substitute for speech, and when it does, it embodies the resilient properties of language. Under other circumstances, gesture can form a fully integrated system with speech. When it does, it both predicts and promotes learning.

INVITED LECTURE 2

Reverse-engineering the core of human common sense

Saturday, January 6, 8:45-10:00

Joshua Tenenbaum

Massachusetts Institute of Technology, USA

I will talk about our long-term research program attempting toreverse-engineer the form, content and origins of core commonsense knowledge in the human mind. Recent successes in artificial intelligence (AI) might suggest that we are close to solving this problem, but we are not. Even a one-year-old infant has a far deeper and broader notion of commonsense than any machine yet built, and this core intelligence is enriched and extended tremendously over the next few years of life. What is the difference between a child’s mind and today’s AI technologies? And what are the prospects for understanding children’s intelligence in the same terms that we might use to build an intelligent machine?

I will focus on reverse-engineering the mental models underlying core intuitive physics and intuitive psychology, the basic commonsense reasoning capacities that have been studied empirically in infants over the last several decades, although much of the work I talk about will be studying these abilities quantitatively in adults. I will also talk briefly about mechanisms by which people can build new mental models — new concepts or new conceptual systems — such as an intuitive physical or psychological theory, or the rules of interpretation in natural language. I will introduce some of the basic formal machinery we use, based on probabilistic programs, game engine simulators, and program induction, along with some of the experimental paradigms that have been developed to test these models empirically in both adults and children.

INVITED SYMPOSIUM

DECISION-MAKING: FROM PERCEPTION TO SOCIAL COGNITION

Friday, January 5, 17:30-19:15

Speakers:
Floris de Lange, Donders Institute, Netherlands
Sid Kouider, CNRS / ENS, France
Celeste Kidd, University of Rochester, US

Chair:
József Fiser, Central European University, Hungary

How is visual perception biased?

Floris de Lange
Donders Institute, Netherlands

Sensory signals are highly structured in both space and time. These regularities allow expectations about future stimulation to be formed, thereby facilitating perceptual decisions about visual features and objects. In my talk, I will discuss recent data that elucidate how temporal and spatial context change sensory computations in the visual system and modify perception and post-perceptual decision-making. I will also compare the effects of time and space with the effects of learnt statistical regularities on the neural and behavioral response.

Know thyself early on! The emergence of core metacognition in infants

Sid Kouider
CNRS / ENS, France

When do children start reflecting upon their own cognitive states, an ability referred to as metacognition? Because young children typically give inaccurate verbal self-reports, it has been assumed that self-reflective abilities do not mature until late childhood. This claim is

now challenged, as new studies relying on non-verbal paradigms reveal that rudimentary forms of metacognition - such as the ability to estimate decision confidence or to monitor errors - are present much earlier in development. I will present a series of experiments demonstrating that infants reflect upon their own decisions to evaluate their performance and adapt subsequent behaviour. After performing a binary choice, 12 and 18-month old infants display appropriate decision confidence by persisting more following correct as compared to incorrect decisions, even in the absence of external feedback. Furthermore, an electrophysiological marker of error detection, the Error-Related Negativity, is elicited when 12 month-old infants make incorrect decisions. Hence, although explicit forms of metacognition might mature later during childhood, core mechanisms of metacognitive sensitivity are already functional during the first year of life. This new line of evidence suggests that metacognition develops along two fundamentally distinct trajectories. While core metacognitive capacities are already present in infancy, flexible and explicit aspects of metacognition are only acquired through an effortful developmental process extending over childhood. I will conclude on how this dual-process approach to metacognition impacts our perspectives on learning and education.

Computational models of curiosity for understanding learning

Celeste Kidd
University of Rochester, USA

The talk will discuss approaches aimed at understanding the computational mechanisms that drive learning and development in young children. Although infants are born knowing little about the world, they possess remarkable learning mechanisms that eventually create sophisticated systems of knowledge. We discuss recent empirical findings about learners' cognitive mechanisms—including attention, curiosity, and metacognition—that permit such striking learning throughout infancy and childhood. We will review evidence that infants enter the world equipped with sophisticated attentional strategies that select intermediately complex material to maximize their learning potential (the "Goldilocks effect" of infant attention, e.g., Kidd, Piantadosi, & Aslin, 2012, 2014; Piantadosi, Kidd, & Aslin, 2014). We will also discuss more recent work on the dynamics of idealized attention in complex learning environments, with a focus on attentional-switching patterns and their implications for understanding learning (e.g., Pelz, Piantadosi, & Kidd, 2015; Pelz, Yung, & Kidd, 2015; Wade & Kidd, under review). We will also touch on how these general mechanisms facilitate not only smart attentional decisions, but also good decision-making in general (e.g., Kidd, Palmeri, & Aslin, 2013).

SYMPOSIA AND PAPER SESSIONS

REGULAR SYMPOSIUM 1

NEW DIRECTIONS IN STUDYING TRUST IN INFANTS AND YOUNG CHILDREN

Thursday, January 4, 13:00-14:00

Organizer:

Yuyan Luo, University of Missouri, USA

Speakers:

Yuyan Luo, University of Missouri, USA
Nazli Altinok, Central European University, Hungary
Lori Markson, Washington University in St Louis, USA
Norbert Zmyj, TU Dortmund University, Germany

Trust – the belief in the reliability, truth, or ability of a person to do a promised or expected action (Hardin, 2002) is a cornerstone of social interactions and interpersonal relationships (e.g., Bowlby, 1969; Erikson, 1963; Simpson, 2007). Over the past decade, developmental psychologists have extensively studied infants and young children's selective trust in others' epistemic states (for reviews, see e.g., Harris, 2012; Mills, 2013; Poulin-Dubois & Brosseau-Liard, 2016; Sobel & Kushnir, 2013). These studies have focused on how variations in an agent's accuracy and intentions might affect children's trust in her (e.g., Pasquini et al., 2007; Shafto et al., 2012). For example, a less trustworthy agent provides inaccurate information (e.g., incorrectly labels familiar objects; Koenig et al., 2004), or is mean to others (e.g., Johnston et al., 2015; Mascaro & Sperber, 2009). At the root of these manipulations is the assumptions that an inaccurate or malevolent agent is unreliable and hence not to be trusted.

To examine selective trust in infancy, researchers have used infants' well-documented capacity to imitate, and thus learn, from others. For example, in Meltzoff (1988), 14-month-olds readily imitated an agent's irrational action of using her head to turn on a lightbox. Gergely and colleagues (2002) found that when given reasons why the agent used her head (i.e., her hands were occupied), infants used their hand instead of blindly trusting the agent. More recent research suggests that infants and young children also seem to consider the agent's competence or reliability, even the agent's social group membership marked by language or race (Brooker & Poulin-Dubois, 2013; Buttelmann et al., 2013; Howard et al., 2015; Krieger et al., 2016; Poulin-Dubois et al., 2011; Zmyj et al., 2010) in their selective imitation of her.

The present symposium, consisting of four different research groups, extends the research on selective trust in three aspects. First, new cues to young children's epistemic trust are examined. Specifically, Talk 1 focuses on how the cue of behavioral predictability (an agent making transitive choices) affects infants' selective imitation. Talk 2 examines how young children selectively trust two agents in imitation when the efficiency of the agents' goal-directed actions was pitted against the language they spoke. Second, how children decide to trust others in social situations is investigated in the delay-of-gratification marshmallow task (Talk 3). Additionally, this study factored in the race of the agent, Black- or White-American, and demonstrated how trust across race differed in Black and White preschool age children. Lastly, while trust in others seems beneficial to young children's learning from or interacting with them, the study in Talk 4 went a step further to show that trust appeared to prevent children from appropriately understanding false beliefs held by the agents they usually trust, an adult or an accurate agent. In sum, the studies open new horizons in trust research by throwing light on how infants and young children decide to trust, how contextual factors such as race influence this process, and even how trust could interfere with children's complete understanding of others.

Infants' selective imitation of a transitive and an intransitive agent

Yuyan Luo, Q. Willin Weng
University of Missouri, USA

By definition, trust (the belief that others can be relied upon) depends on others' reliability, e.g., if they are predictably knowledgeable to learn from. Recent efforts to examine selective trust in infancy use imitation tasks (e.g., if infants choose to copy an agent's unusual action of using her forehead to activate a lightbox). For instance, infants are less likely to imitate an agent if he first used artifacts in unconventional ways or gave wrong labels to familiar objects. In real life, however, people do not always behave in such obvious defiance of social conventions or expectations. Deciding whether to trust someone requires judging their reliability based solely on the predictability of their behavior. We thus used 16-month-olds' ability to judge the transitivity of others' choices and hypothesized that after seeing a person make transitive choices, infants should decide that her behavior is predictable because her choices conform to logic and hence trust her. In the study, after

seeing an agent's choices among objects (A>B, B>C, A>C), infants then watched her demonstrate the head-touch actions on the lightbox. A majority of infants then used their head to touch it, suggesting their trust in the transitive agent's ways of acting on artifacts. Conversely, when the agent chose intransitively (A>B, B>C, C>A), infants were more likely to use their hand to touch the lightbox, showing their distrust. These and control results thus demonstrate how the predictability of an agent's behavior (i.e., making transitive or intransitive choices) affects infants' trust in the agent.

Shared-language cue in modulating epistemic trust in 4-year-old children: an over-imitation study

Nazli Altinok[1], Mikolaj Hernik[1], Ildikó Király[1,2], György Gergely[1]

[1]Central European University, Hungary, [2]ELTE, Hungary

We propose that shared-language signals informant's reliability in her potential to offer relevant information. We hypothesize that cognitively opaque action strategies, which involve performing a sequence of irrelevant actions followed by a single relevant and efficient instrumental action, will be acquired and retained better when presented ostensively by demonstrators who are perceived as belonging to the children's own social group and as such are evaluated as reliable epistemic sources. In contrast, we predict that children should be more resistant to accept counterevidence even if it consists of an ostensively demonstrated and more efficient alternative, when it originates from foreign-language speakers. To test this we employed an over-imitation paradigm by Hoehl et al. (2014) with 4-year-olds. Participants first saw an agent who demonstrated how to retrieve a sticker from a novel apparatus *inefficiently* (by ostensively performing a series of superfluous actions before presenting the relevant action). Subsequently, they saw a second demonstrator retrieving a sticker from the same apparatus *efficiently* (by ostensively performing the relevant-action only). Participants had their turn on the apparatus following each demonstration. For half of them the first demonstrator was a speaker of their native language and the second demonstrator was a foreign-language speaker, and vice-versa for the other half. We found that children corrected their inefficient strategy acquired from a foreigner after viewing the efficient demonstration from a native-language-speaker, but persisted in inefficient strategy acquired from the native-language-speaker despite efficient counterevidence provided by the foreigner. This finding demonstrates that shared-language cue modulates 4-year-old children's over-imitative behaviors.

Does race affect children's trust in others?

Lori Markson, Hyesung Grace Hwang, Taylor Bird McGuire

Washington University in St Louis, USA

Intergroup bias – a preference for individuals who are like me and distrust of others who are not like me – emerges in early childhood. It is unclear how race influences the development of children's trust in others. Children do appear to be more trusting of information conveyed by in-group over out-group members (Chen, Corriveau, & Harris, 2013). They are also more likely to delay gratification for a trustworthy adult over an untrustworthy one (Michaelson & Munakata, 2016). The current study investigated 3- to 6-year-old Black and White children's trust in people of the same or a different race. Children were recruited from racially homogeneous preschools where the majority of the children matched the race of the child (Black or White). In a delayed gratification task, children were given a marshmallow and instructed to wait and not eat it by a White or Black experimenter the child had never met. The results were striking: Black children's waiting time was not affected by the experimenter's race (Mwhite = 420.10s (112.527); Mblack = 407.85s (105.193); t(21) = -.079, p = .938). However, White children waited significantly longer for a White experimenter (Mwhite = 833.13s (46.165) compared to a Black experimenter (Mblack = 499.56s (89.724); t(15) = -3.180, p = .006). The findings suggest that White American children's trust across race differs from that of Black American children. Data collection from children in racially integrated schools is near completion, which will allow us to compare how exposure to diversity affects children's trust in others.

A model's age and competence influence children's attribution of false beliefs

Norbert Zmyj[1], Sabine Seehagen[2]

[1]TU Dortmund University, Germany, [2]University of Waikato, New Zealand

People differ in the knowledge of facts and children are aware of these differences. For example, children perceive adults as more knowledgeable than peers. We tested whether these preconceptions influence preschoolers' attributions of false beliefs. In Experiment 1, 4- and 5-year-olds watched videos showing a peer or an adult protagonist experiencing events that should lead the protagonist to hold a false belief. Then, children were asked to infer the protagonist's perception of the situation. Four- but not 5-year-old children were

more likely to judge that the peer protagonist held a false belief than the adult protagonist would. This suggests that 4-year-old children's tendency to regard adults as experts in general knowledge undermined their ability to judge accurately the possibility that an adult could hold a false belief. In Experiment 2, we tested whether 4.5-year-olds' attribution of false beliefs is influenced by a person's previously demonstrated competence. The children watched two protagonists who labeled familiar objects either correctly or incorrectly. Subsequently, these protagonists labeled novel objects differently and it was tested whether children trusted the competent protagonist more than the incompetent protagonist. Finally, one of the protagonists experienced a situation in which it was reasonable to attribute a false belief to this protagonist. Children were more likely to identify a false belief in the incompetent protagonist, compared to the competent protagonist. The experiments suggest that children's false-belief understanding is susceptible to situational influences and thus challenges the view of false-belief understanding appearing in a stage-like manner.

PAPER SESSION 1

AGENCY

Thursday, January 4, 16:30-17:30

Chair:

Mikołaj Hernik, Central European University, Hungary

Social predispositions for animate motion and their neural correlates in a visually naive animal model

Orsola Rosa-Salva

University of Trento, Italy

Similar inborn predispositions to attend to visual features distinctive of animate agents are shared between newborn babies, other primates, and even visually naive domestic chicks. Chicks' preferences are elicited by features such as face-like patterns, self-initiated or semi-rigid motion (determined by the skeletal structure of legged vertebrates). Here we demonstrate that naive chicks are attracted by other elementary motion properties that reveal an internal energy source to the moving object (self propulsion) and elicit the perception of animacy in human observers. Newly-hatched chicks preferentially approached a stimulus that spontaneously accelerates and then decelerates over another that moved constantly at the same average speed. Increasing the complexity of movement of the control stimulus did not alter chicks' preference, which was abolished only by occluding the speed-change events. Chicks also have a preference for objects keeping their body axis aligned to their trajectory, a feature typical of the motion of bilateria (due to the constraints posed by their body-plan) and associated with animacy perception in human observers. Using the immediate early gene product c-Fos as a neuronal activity marker, we also demonstrated that areas controlling social behaviour in adult vertebrates already respond to the first exposure to visual cues associated with animate motion. Differential activation was found in septum, preoptic area and in amygdaloid nuclei of naive chicks exposed either to the naturalistic motion of a conspecific or to a simple object changing its motion speed, but not to rigid or constant motion.

Object-tracking at ten months: the role of dynamic information

Gisella Decarli, Manuela Piazza, Laura Franchin, Luca Surian
University of Trento, Italy

In this study we investigated an attentional indexing system involved in individuation and identification tasks (Leslie et al., 1998; Kaldy & Leslie, 2003). According to Leslie and colleagues, to understand the development of object tracking in infants we need to rely on the distinction between 'where' and 'what' system; the first one treats locational information and appears early in infants' development, while the second one is related to featural information (e.g. shape) and it is not completely connected to the object indexing system until 12 months. However, this model doesn't explain some results obtained with younger infants, e.g. 10-month olds can rely on humanlike features to individuate different objects (Bonatti et al., 2002; Surian & Caldi, 2010). Here, we use the violation of expectancy to test the hypothesis that young infants assign distinct object files based only on dynamic information. In this study 10-month old infants observed a complex individuation task in which two objects alternately emerged from behind a screen; one of them was 'agent' object with an autonomous movement, while the other was 'inert' object. The objects differed only for the type of motion and were identical with respect to all the other features. Then the screen was removed, showing either one object or two objects. Infants looked significantly longer at the one-object test events. These data support the idea that infants younger than 12 months rely on dynamic information to individuate objects and do not easily bind non-dynamic information in their object files.

What entities do infants endow with moral rights?

Fransisca Ting, Reneé Baillargeon
University of Illinois at Urbana-Champaign, USA

How do infants determine what entities have moral rights? Building on prior findings, one possible hypothesis is that infants endow animate entities with moral rights. In the present study, 14-month-olds watched a human experimenter divide windfall resources between two novel entities: boxes that were first shown to be animate (i.e., both self-propelled and agentive), only self-propelled, or only agentive. These boxes bore no morphological resemblance to humans or to non-human animals and did not speak a human language. Of interest was whether infants would expect a fair distribution when the entities were animate, but would hold no particular expectation when the entities were only self-propelled or only agentive.

Infants first received two familiarization trials. In the animate condition, the two boxes moved (self-propulsion) then beeped at each other in a contingent manner, as though having a conversation (agency). In the self-propelled condition, only one box moved and beeped in each trial, so that its beeps now appeared random. In the agentive condition, the boxes held a conversation but never moved. In all conditions, infants next saw two test events (order counterbalanced) in which a human experimenter divided toys either fairly or unfairly between the boxes.

Infants in the animate condition looked significantly longer at the unfair than at the fair event, whereas infants in the self-propelled and agentive conditions looked equally at the events. These results indicate that by 14 months, infants endow novel animate entities with moral rights, including the right to a fair share of a windfall resource.

PAPER SESSION 2

CAUSAL LEARNING

Friday, January 5, 9:00-10:00

Chair:

Dora Kampis, Central European University, Hungary

Developmental differences in active causal learning across preschool age reveal different hypothesis-space structures

Angela Jones[1], Doug Markant[2], Thorsten Pachur[1], Alison Gopnik[3], Azzurra Ruggeri[1]

[1]Max Planck Institute for Human Development, Germany, [2]University of North Carolina, USA, [3]University of California, USA

What is this patient's diagnosis? To navigate in a world of uncertainty, we have to learn how to make accurate predictions based on previous evidence. To do this, we first have to infer the causal relationship between certain cues (e.g., symptoms) and the observed outcome (e.g., disease). Sometimes we have the opportunity to actively manipulate cues to generate the evidence needed to efficiently infer the causal structure of a system. In this paper we explore the early development of this ability, by investigating how 5- and 6-year-olds select which evidence to observe when learning the causal structure of a system to make accurate predictions. In our task, preschoolers decide which monster pairs to see running in a race, to learn how two cues (color and shape) predict relative speed and later bet on the winning monsters. We use computational modeling techniques to infer from children's decisions how their hypothesis-space is structured. We find that 6-year-olds' decisions and performance are better predicted by a model in which the hypothesis-space is organized hierarchically by abstracting cue structure, and encoding cue direction and order (cue-based model). However, 5-year-olds' decisions are better fit by a model in which the relative speed of individual monsters is encoded, without abstracting cue relationships (combination-based model). Our results suggest that developmental changes in active causal learning may reflect different hypothesis-space representations. We are currently testing 7-year-olds in order to further explore this developmental progression.

The developmental and evolutionary origins of inferring unseen causal structures

Zeynep Civelek, Josep Call, Amanda Seed

University of St Andrew, UK

One route to exploiting causality is through theorizing about the relations between events. It has been argued that children can do this from an early age, but whether or not nonhuman primates can go beyond associative learning when exploiting causality is controversial (Penn & Povinelli, 2007). However, children learn about causal structures through explicit teaching too and language has been shown to scaffold their abilities (Bonawitz et al., 2010; Butler & Markman 2012). We aimed to examine reasoning in the absence of causal language cues to enable a direct comparison between children and other primates. Preschool children (N= 129) and chimpanzees (N= 11) were presented with an event in which a reward was dropped through a forked tube into one of the two cups. Subjects needed to learn to use an auditory cue to locate the reward. In the causal condition, the cue followed the dropping event, making it plausible that the sound was caused by the reward falling into the cups; and in the arbitrary condition, the cue preceded the dropping event, making the relation arbitrary. It was hypothesized that subjects would perform better in the causal than in the arbitrary condition if they could reason about the causal structure. By four years of age children performed significantly better in the causal condition than the arbitrary one; whereas chimpanzees performed at chance level in both conditions. The findings suggested a difference between preschool children and chimpanzees when dealing with unseen causes even without verbal prompting.

Causality influences children's perception of temporal order

Emma C Tecwyn[1], Christos Bechlivanidis[2], Teresa McCormack[3], Sara Lorimer[3], Emma Blakey[4], David A. Lagnado[2], Christoph Hoerl[5], Marc J Buehner[1]

[1]Cardiff University, UK, [2]University College London, UK, [3]Queens University Belfast, UK, [4]The University of Sheffield, UK, [5]University of Warwick, UK

While it has long been known that time is a cue to causation (e.g. temporal priority and contiguity principles), recent work with adults has demonstrated that causality also influences our experience of time. If event A is believed to cause event B, then even if in fact event B occurs before event A, adults report the causally consistent order of events (AB),

rather than the correct, temporally objective order (BA): the causal reordering phenomenon (Bechlivanidis & Lagnado, 2016). In this study we investigated, for the first time, whether children's perception of temporal order is influenced by causality. Elucidating the developmental trajectory of causal reordering has potential to enhance our understanding of both temporal and causal cognition. Participants (4-6 year-olds, N=77; 6-8 year-olds, N=97; 8-10 year-olds, N=89; and adults, N=42) either saw a 3-object Michotte-style 'pseudocollison' test clip, or a 2-object control clip. In the test clip, object A moved towards object B, but upon making contact with it, object C moved then object B moved (ACB).The control clip was identical, except for object A was omitted, so C moved then B moved (CB). For all age groups, participants were less likely to report the correct temporal order of events, and more likely to incorrectly report contact between objects B and C in the test clip than the control clip (Chi-square tests, $p<0.01$ for all). These findings provide the first evidence that children's temporal order judgements are – like adults' – influenced by causality.

REGULAR SYMPOSIUM 2

THE DEVELOPMENT OF BODY REPRESENTATION: FROM INFANT CORTICAL RESPONSES TO CHILDREN LOCALISATION ABILITIES

Friday, January 5, 10:30-12:00

Organizers:

Silvia Rigato, University of Essex, UK

Maria Laura Filippetti, University of Essex, UK

Speakers:

Silvia Rigato, University of Essex, UK

Andrew J. Bremner, Goldsmiths University of London

Maria Laura Filippetti, University of Essex, UK

Discussant:

Dorothy Cowie, Durham University, UK

Research on the developmental origins and trajectories of body representation have recently garned accelerated interest within psychology and neuroscience communities, with a renewed interest on the behavioural and neurophysiological mechanisms underlying body awareness and self-other distinction.

How do we become adults aware of our own body and sensations? When do we start to differentiate sensory signals concerning the own body from those of others', and at the same time able to share others' states?

In this symposium we will try to answer these questions linking physiological and behavioral evidence of the development of body representation in infants and children. We will present new research work encompassing investigations from neural responses to visual body stimuli and to tactile stimulation in young infants to proprioceptive hand localisation abilities in children.

Specifically, in the first talk, Silvia Rigato will present data from 3 age groups of infants showing how visual ERPs to upright and inverted body images (compared to face images) develop in the first year of life. The results are in favour of a gradual emergence of the structural encoding of the human body form, which is possibly associated to the infant motor development and the experience of viewing complete body shapes.

In the second talk, Andrew Bremner will show how viewing another person's hand being touched modulates the somatosensory evoked potentials (SEPs) to tactile stimulation in 4-month-old infants. These findings suggest that, already at this young age, the somatosensory cortex plays a role not only in the personal experience of a state (e.g. touch) but also when that state is passively observed in other individuals.

In the final talk, Maria Laura Filippetti will present and discuss behavioral evidence of the emergence and development of sensitivity to internal bodily signals in childhood. Data from a hand localisation task supports the view of a gradual development of body awareness and integration of intero-proprioceptive signals.

Altogether, these findings point towards a trajectory of development in the first years of life in which infants and children learn to combine sensory cues concerning the body arising from vision, touch, somatosensensation, and interoception. The successful integration of these signals allow infants and children to accurately perceive their body around the environment and in relation to other human beings, to engage in successful interactions, and to interpret other people's feelings in relation to one's own internal states.

How do bodies become special? The emergence of body-related cortical-processing in the first 14 months of life

Silvia Rigato, Helge Gillmeister

University of Essex, UK

There is general consensus that the representation of the human face becomes functionally specialised within the first few months of an infant's life. The literature is divided, however, on the question whether the specialised representation of the remainder of the human body form follows a similarly rapid trajectory or emerges more slowly and in line with domain-general learning mechanisms. This study investigates visual ERPs in infants (P1, N290, P400, and Nc) of three age groups (3.5, 10, and 14 months) to track the emergence of face- and body-structural encoding. Our findings show that visual ERPs were absent (P1, N290, P400) or smaller (Nc) for bodies than for faces at 3.5 months and peaked later (N290, P400) for bodies than for faces at older ages. Inversion effects for bodies were not reliably found until 14 months (P400 amplitudes). In contrast, inversion effects for faces were present from 3.5 months (N290 latencies). Inverted faces produced an adult-like pattern for P400 at older ages (enhanced P400 amplitudes from 10 months, longer P400 latencies from 14 months), emphasising the role of P400 as the precursor of the adult N170. Importantly, our findings argue that structural encoding of the human body form emerges later in infancy and is qualitatively different from the structural encoding for faces. This is commensurate with infant motor development and the experience of viewing complete body shapes later than faces.

Cortical signatures of vicarious tactile experience in four-month-old infants

Andrew J. Bremner[1], Michael J. Banissy[1], Silvia Rigato[2]

[1]Goldsmiths, University of London, UK, [2]University of Essex, UK

The human brain recruits similar brain regions when a state is experienced (e.g., touch, pain, actions) and when that state is passively observed in other individuals. In adults, seeing other people being touched activates similar brain areas as when we experience touch ourselves. Here we show that already by four months of age, cortical responses to tactile stimulation are modulated by visual information specifying another person being touched. We recorded somatosensory evoked potentials (SEPs) in 4-month-old infants while they were presented with brief vibrotactile stimuli to the hands. At the same time that the tactile stimuli were presented the infants observed another person's hand being touched by a soft paintbrush or approached by the paintbrush which then touched the surface next to their hand. A prominent positive peak in SEPs contralateral to the site of tactile stimulation around 130 ms after the tactile stimulus onset was of a significantly larger amplitude for the "Surface" trials than for the "Hand" trials. These findings indicate that, even at four months of age, somatosensory cortex is not only involved in the personal experience of touch but can also be vicariously recruited by seeing other people being touched.

Within and outside the developing body

Maria Laura Filippetti[1], Aikaterini Fotopoulou[2]

[1]University of Essex, UK, [2]University College London, UK

The ability to integrate signals arising from within and outside the body is fundamental for the experience of one's own body as belonging to oneself. Recently, the adult research has shown the fundamental relationship between interoceptive and exteroceptive sensory cues for body awareness, suggesting that own-body perception results from the dynamic interplay between these signals. Nonetheless, while extensive evidence supports the presence of some implicit exteroceptively-driven body perception in infancy, fundamental questions remain about the development and acquisition of sensitivity to internal bodily signals.

The present study aimed to investigate whether external manipulations of interoceptive signals can influence proprioceptive hand localisation abilities in children. Multisensory mechanisms for own-hand perception (using the classic RHI) have been shown to develop to adult levels by 10 years of age, suggesting that visual information about the hand (i.e. visual capture) seems to be the strongest cue to body location in younger children. In this study we decreased visual-proprioceptive integration by prompting children with intero-proprioceptive signals (CT-optimal touch) about their hand position, whilst they were watching a realistic rubber hand. We show that, in contrast to adults, prolonged CT-optimal affective stroking of the real hand in children interferes with visual-proprioceptive integration of the visual location of the rubber hand and the proprioceptive location on the own hand. These findings reinforce the proposal that the ability to become aware of our body develops gradually in childhood and further suggest that the ability to integrate intero-proprioceptive signals might follow a similar late-developing pattern.

REGULAR SYMPOSIUM 3

COMPARATIVE APPROACHES TO SOCIO-COGNITIVE DEVELOPMENT

Friday, January 5, 13:00-14:30

Organizers:

Patricia Kanngiesser, Freie Universität Berlin, Germany

Moritz Köster, Freie Universität Berlin, Germany

Speakers:

Alexandra Rosati, University of Michigan, USA

Patricia Kanngiesser, Freie Universität Berlin, Germany

Moritz Köster, Freie Universität Berlin, Germany

Peter R. Blake, Boston University, USA

Comparative approaches can provide unique insights into the phylogenetic and ontogenetic foundations of human social cognition. Cross-species and cross-cultural research allows to elucidate (i) features of socio-cognitive development that are shared between humans and other animal species, (ii) features which are unique to humans, and (iii) the influence of different cultural contexts on socio-cognitive development (Henrich et al., 2010; Keller & Kärtner, 2013; McLean et al., 2012; Nielsen et al., 2017; Rogoff & Chavajay, 1995). Yet, to date a comparative perspective is still underrepresented both in empirical research and theorizing about human social cognition and its development. This symposium brings together four talks that demonstrate the benefits and novel insights that can be gained from employing a cross-species (talks 1 and 2) and cross-cultural approaches (talks 3 and 4). Specifically, the first talk demonstrates that the development of social attention differs in two closely related monkey species with different social styles, emphasizing the role of social context in shaping developmental processes in primates. The second talk shows that cooperative ownership agreements are found in human children across diverse societies but not in great apes, indicating limitations in non-human primates socio-cognitive skills. The third talk explores the role of socialization practices on early prosocial behaviour in four different socio-cultural contexts, showing that culture-specific socialization styles influence infants' helping behaviour from early on in development. The fourth talk focuses on the development of fairness and shows that disadvantages inequity aversion is stable across diverse social and cultural contexts, but that advantages inequity aversion varies across

societies. Taken together these talks provide a comprehensive and nuanced picture of the impact of biological, social and cultural factors on the development of social cognition in humans and other primates. They also demonstrate how the study of socio-cognitive development can benefit from integrating comparative perspectives and provide a roadmap for future research into the foundations of social cognition.

Developmental shifts in monkey social attention

Alexandra Rosati
University of Michigan, USA

Gaze following, or co-orienting with others, is a critical social-cognitive capacity allowing individuals to acquire information about their social and physical environment. This is a foundational social skill in human ontogeny, but little is known about its emergence and development in other species. Studies of other primates can provide insight into the origins and biological function of these psychological abilities in humans. I will discuss work examining age-related changes in the social cognition of two closely related species that vary in social style: rhesus macaques (Macaca mulatta) are characterized by steep dominance hierarchies and aggression, whereas Barbary macaques (Macaca sylvanus) display more tolerant and affiliative interactions. In comparisons of semi-free-ranging macaque populations with wide variation in age, both species follow gaze to a distant target more in test trials where an actor looked up compared to control trials. However, these species differ in their ontogenetic trajectories. In rhesus macaques, gaze following emerges during infancy, peaks in the juvenile period, and then declines with age—similar to patterns seen humans. In contrast, tolerant Barbary macaques maintained high levels of social attention even through old age. This indicates that developmental patterns of social attention vary with tolerant social systems across primates. Together, this work demonstrates that comparative studies of cognitive development and aging in other primates can provide new insights into the evolutionary processes shaping human cognition.

Ownership from a comparative, cross-cultural, and developmental perspective

Patricia Kanngiesser[1], Federico Rossano[2], Ramona Frickel[3], Anne Tomm[3], Daniel Haun[4], Henriette Zeidler[3], Michael Tomasello[3]
[1]Freie Universität Berlin, Germany, [2]University of California San Diego, USA, [3]Max Planck Institute for Evolutionary Anthropology, Germany, [4]Universität Leipzig, Germany

Ownership is based on cooperative agreements between individuals: individuals inhibit their tendency to take others' property if those others will do the same. Owners can thus trust others to respect their property – even in the owner's absence. We investigated in three studies (i) whether ownership is specific to humans as compared with other apes, and (ii) whether cooperative agreements of ownership are universal in children from diverse human societies. In study 1, we found that dyads of chimpanzees and bonobos did not respect their partner's ownership of food resources and instead maximized their own outcomes. In study 2, we found that dyads of German four-year-olds respected their partner's ownership almost completely. In study 3, we showed that dyads of five- to seven-year-old children from three non-Western societies with few personal possessions respected their partner's ownership – though somewhat less than German children. Respect for ownership thus seems to be uniquely human and, at least to some degree, universal in humans. These findings cast doubt on claims that humans share with other animals an evolved predisposition for ownership. We suggest that apes and other animals have a notion of possession (i.e., of things under their immediate physical control), but that only humans have the social and cognitive prerequisites to develop and sustain cooperative ownership agreements.

Maternal socialization of early helping behavior in different cultural contexts

Moritz Köster[1], Joscha Kärtner[2]
[1]Freie Universität Berlin, Germany, [2]Universität Münster, Germany

The involvement in daily chores by family members is an important context for the development of early helping behavior. In two cross-cultural studies, we investigated how mothers from different cultural contexts assign tasks to their children and how this relates to their toddlers helping behavior. In study 1, we found that mothers from rural Brazil request their

toddlers (18-32 month) in a serious and insistent way (assertive scaffolding), while German mothers asked, plead, and gave explanations (deliberate scaffolding). Importantly, assertive scaffolding was associated with toddlers' helping in rural Brazil, while mothers' deliberate scaffolding related to toddlers' helping behavior in urban Germany. These findings suggest culture-specific developmental pathways along the lines of interpersonal responsibility and personal choice. In study 2, we compared an urban German and an urban Japanese sample, using the same tasks, but at a younger age (16 month). This was to investigate how maternal scaffolding of chores differs between Japanese and German mothers and to test whether maternal culture-specific socialization may influence infants' prosocial tendencies already at an earlier age. German mothers employed deliberate scaffolding strategies (like in the first study), while Japanese mothers asked their children in a sensitive way (using a high tone of voice and diminutives). However, there was no relation between maternal scaffolding and children's helping at this early age. To conclude, mothers employ culture-specific scaffolding of daily chores shortly after their infants' first birthday (study 2), before cultural learning effects toddlers' helping behavior later in the first year (study 1).

Using culture to investigate the development of fairness

Peter R. Blake[1], Katherine McAuliffe[2], Felix Warneken[3], John Corbit[4], Tara Callaghan[5], Anni E. Kajanus[6]

[1]Boston University, USA, [2]Boston College, USA, [3]University of Michigan, USA, [4]Simon Fraser University, Canada , [5]St. Francis Xavier University, [6]University of Helsinki, Finland

A dislike of inequality is fundamental to our sense of fairness. However, humans tend to have a stronger aversion to receiving a disadvantage than to receiving an advantage. I will present a series of studies examining these two aspects of fairness across cultures. In Study 1, children in seven societies paid a cost to reject a disadvantage relative to a peer, but children rejected an advantage in a costly manner in only three societies. In Study 2, we combined experiments with an ethnographic study to investigate the causes of inequity aversion in two schools in China with different norms and teaching practices. Children in both schools rejected both forms of inequality, but the ethnography suggests that rejecting an advantage may be motivated by different social influences in the two schools. In Study 3, we evaluated children's willingness to reject inequality after collaborating to obtain the rewards. We tested children in Canada and rural India, a site in which children tended to accept an advantage in Study 1. Children in India rejected an advantage after collaboration but not after parallel work, and rejected a disadvantage in both conditions.

Combined these studies suggest that an aversion to disadvantage is a stable feature of human cognition and resistant to social influences. By contrast, an aversion to advantage varies across societies and can be produced by multiple social factors.

PAPER SESSION 3

NEUROIMAGING OF THEORY OF MIND

Friday, January 5, 16:30-17:30

Chair:

Katarina Begus, Central European University, Hungary

Development of the social brain from age three to twelve years

Hilary Richardson[1], Grace Lisandrelli[2], Alexa Riobueno-Naylor[3], Rebecca Saxe[1]

[1]Massachusetts Institute of Technology, USA, [2]Indiana University, USA, [3]Wellesley College, USA

Over the past decade, fMRI research has made significant progress identifying functional divisions of labor within the adult "social brain." For example, in human adults, distinct networks of brain regions are recruited to reason about the bodies (physical sensations) and minds (mental states) of others. The current study characterizes the developmental trajectory of these two functionally specialized networks, and tests for relationships between functional specialization of these networks and behavioral developments in reasoning about the minds of others ("Theory of Mind", ToM). A large cross-sectional sample of children ages three to twelve years old (n=122), in addition to a group of adults (n=33), watched a short, animated movie while undergoing fMRI. The movie highlights the physical sensations (often pain) and mental states (beliefs, desires, emotions) of the main characters, and, critically, provides an experimental context that is feasible and engaging for even the youngest children. Using interregional correlation analyses and reverse correlation analyses of the response timecourses in ToM and pain brain regions, we find evidence that 1) ToM and pain networks are functionally distinct by age three years, 2) functional specialization increases throughout childhood, and 3) functional maturity of each network is related to increasingly anti- correlated responses between the two networks. Further, these data provide evidence that the most studied milestone in ToM behavioral development, passing explicit false-belief tasks, does not correspond to discontinuities in the development of the social brain.

Functional organization for theory of mind in preverbal infants: A near-infrared spectroscopy study

Daniel C. Hyde, Charline E. Simon, Fransisca Ting, Julia Nikolaeva

University of Illinois at Urbana-Champaign, USA

Successful human social life requires imagining what others believe or think to understand and predict behavior. This ability, often referred to as theory of mind, reliably engages a specialized network of temporal and prefrontal brain regions in older children and adults, including selective recruitment of temporal-parietal junction (TPJ). To date, how and when this specialized brain organization for ToM arises is unknown due to limitations in functional neuroimaging at younger ages. Here we employed the emerging technique of functional near-infrared spectroscopy (fNIRS) to measure the functional brain response across the parietal, temporal, and prefrontal regions in 7-month old male and female infants as they viewed different video scenarios of a person searching for a hidden object. Over different conditions, we manipulated whether the person held an accurate (true) or inaccurate (false) belief about the location of the hidden object in the videos. We observed that the TPJ, but not other temporal and prefrontal regions, spontaneously tracked the beliefs of the other person, responding more during scenarios when the other person's belief regarding the location of the object was false compared to scenarios where her belief was true. These results mirror those obtained with adults to show that TPJ is already functional organized for high-level social cognition by around 7-months. Furthermore, these results suggest that infants may draw on similar core mechanisms to implicitly track beliefs as do adults do when explicitly reasoning about them.

Fourteen-month-olds follow how others understand words

Bálint Forgács[1,2], Eugenio Parise[3,4], Gergely Csibra[4,5], György Gergely[4], Judit Gervain[1]

[1]Université Paris Descartes, France, [2]Eötvös Loránd University, Hungary, [3]Lancaster University, UK, [4] Central European University, Hungary, [5]Birkbeck College, University of London, UK

We set out to investigate the interplay between semantic comprehension and Theory-of-Mind capacities in 14-month-old infants. We wanted to know how infants' brain process the linguistic (mis)understanding of an adult communicative partner in an object naming paradigm involving false beliefs, by recording event-related potentials. We presented infants with various toys that are likely to be known to them (e.g., shoe, apple, book, etc.), and named them in the presence of an adult observer. In half of the trials, we changed the object without the knowledge of the observer and named the new one, thus it was congruent from the perspective of the infant, but incongruent from the perspective of the observer. In the baseline condition the object naming was congruent for both parties. To confirm that we can evoke a typical N400, an electrophysiological marker of semantic comprehension, we also run a control experiment, where both parties heard either congruent or incongruent labels for objects. First, according to the control experiment, infants reacted to labels incongruent from their perspective with a typical N400, a greater negativity in the 400-600 ms time window. Secondly, in the main experiment, when labels were congruent from infants' own perspective, but incongruent for the observer, we again found an N400 response, statistically not different from that of the control experiment. Additionally, we found a later frontal negativity as well. Infants, like adults, seem to use very similar neural resources to understand language and to track the comprehension of a communicative partner.

REGULAR SYMPOSIUM 4

WHERE CAN PREDICTIVE PROCESSING ACCOUNTS OF AUTISM SPECTRUM DISORDER TAKE US NEXT?

Saturday, January 6, 10:30-12:00

Organizer:

Emma Ward, Donders Institute for Brain, Cognition and Behaviour, Radboud University

Speakers:

Sander van de Cruys, University of Leuven
Rebecca Lawson, University College London
Themelis Karaminis, Radboud University
Catherine Manning, University of Oxford

Autism Spectrum Disorder (ASD) is a pervasive developmental disorder that affects 1-2% of the general population. ASD is characterized by impairments in social communication and the presence of restricted or repetitive behaviours. Attempts to understand ASD began as accounts centred on one of these symptoms, such as the Social Motivation, Weak Central Coherence, and Enhanced Perceptual Functioning theories, among others. More recent theories are moving towards a domain-general mechanistic account of the condition.
One of these mechanistic accounts is the Predictive Processing family of theories. Predictive processing proposes that we are always making predictions about the world based on prior experience, and all information is processed by comparing these predictions with the input we receive. According to this framework, information processing consists of the following steps:

- a prediction about the state of the world,
- the comparison of incoming information with the prediction, to give an error signal,
- the weighting of this error signal based on its usefulness,
- the updating (or not) of future predictions based on this weighting.

The Predictive Processing accounts of ASD all posit that those with ASD differ from typically developing individuals in one or more of these steps, and that this difference in very basic information processing cascades up, leading to impairments in higher-order

cognition such as difficulty understanding another person's intentions, or having a very strong interest in one specific toy.

The current symposium will consist of speakers who will each argue for different sources of atypical Predictive Processing in ASD. They will present their own empirical and computational modeling work, as well as discuss findings of others through the Predictive Processing lens. The aim of this symposium is to identify the next steps we should take to test these theories, eventually leading us to one unifying account of ASD that best explains the source of cognitive and behavioural symptoms.

First, Sander van de Cruys (KU Leuven) will introduce his account of high error-weighting in ASD, and systematically compare this to other information-processing accounts, and will propose future developmental studies on learning and motivation in order to fill our current knowledge gaps. Then Rebecca Lawson (UCL) will introduce the role of neuromodulators in error-weighting in ASD, and present empirical data from studies on learning during uncertainty, and relate these to participants' ASD symptom severity. Themis Karaminis (CLS, Radboud University) will then discuss the development of visual perception in ASD through a framework of weaker predictions about incoming sensory input, based on his empirical work with children with and without ASD, as well as his computational modeling work. Finally, Catherine Manning (University of Oxford) will show that children with ASD can make precise and reliable predictions, contrary to the claims of some instantiations of the Predictive Processing theories, and suggest new directions to test and improve this family of accounts.

The session will highlight points of agreement between the different perspectives as well as areas that still need to be clarified, and try to address the question of what should come next in autism research.

Confronting predictive processing with alternative information processing accounts of autism

Sander van de Cruys, Johan Wagemans

University of Leuven

In recent years, several promising computational theories have been proposed to explain cognitive and behavioral atypicalities in autism spectrum disorder. Here, we want to systematically compare our own predictive processing account (HIPPEA) to other models, such as the "noise accounts", the divisive normalization account, and the "weak priors" account. We discuss to what extent they make different predictions and present our own recent empirical work on this (on orientation perception, on Mooney perception, and on mismatch negativity). Finally, we will argue that developmental studies on intrinsic motivation and (meta-)learning under uncertainty will help fill the gaps in our understanding of cognitive difficulties in autism.

Weighing the past against the present: learning and uncertainty autism

Rebecca Lawson

University College London

Our perception of the sensory present depends strongly on prior expectations derived from the recent sensory past. Adaptive behaviour rests on the ability to dynamically adjust the balance of prior expectations against new sensory inputs in the face of uncertainty. An appealing new hypothesis is that cognitive features of autism can be understood terms of a failure of Bayesian inference, in which prior information is underweighted during sensory processing and perception is less constrained by past experience (Pellicano & Burr, TiCS, 2012). Neurocomputationally, under the predictive coding framework (Friston, Phil. Trans. R. Soc. B, 2005), this amounts to problems with gain control, where estimates of variability (e.g. uncertainty) scale the driving neural responses to sensory input via the action of neuromodulators. In this talk I will first introduce the framework by which adaptive gain control mechanisms may be aberrant in autism (Lawson, Friston & Rees, PNAS, 2016; Palmer, Lawson & Hohwy, Psych Bulletin, 2017). Then I will go on to present some recent data examining how individuals with autism learn about the variability of different kinds of sensory information to build prior beliefs and how these learning dynamics are related to symptom severity and the action of neuromodulators such as noradrenaline (Lawson et al, Nature Neuroscience, 2017). Finally I will discuss the implications of these findings for both typical and atypical neurodevelopment.

Studying the development of visual perception in autistic children under the prism of Pellicano and Burr (2012)

Themelis Karaminis
Radboud University

Pellicano and Burr (2012) suggest that the unique perceptual experiences of individuals with autism might be accounted for by attenuated prior knowledge within a simple computational model of Bayesian perceptual inference. The hypothesis posits limitations in the abilities of autistic individuals to derive, maintain and/or use efficiently summary statistics representations for the recent history of sensory input. Such limitations lead to a processing style where sensory input is modulated to a lesser extent by norms derived from prior sensory experience. I will summarise results from a series of studies on the development of visual perception in autistic and typical children, which targeted key domains of visual perception and included empirical, eye tracking and computational modelling techniques. I will discuss the implications of the findings for the Pellicano and Burr (2012) hypothesis and predictive coding accounts of autism and consider directions for future research.

Autistic children can anticipate moving objects: testing the disordered prediction account of autism

Catherine Manning, Furtuna Tewolde, Dorothy Bishop
University of Oxford

Following contemporary accounts focusing on atypical predictive processing in autism, Sinha et al. (2014) proposed that autistic individuals have impaired prediction abilities, so that the world appears 'magical' with events occurring unexpectedly. Sinha et al. claimed that disordered prediction would result in difficulties interacting with dynamic objects, and in particular anticipating the motion of moving objects. We set out to test this hypothesis using two dynamic extrapolation tasks (Makin & Bertamini, 2014). Thirty autistic children aged 6-14 years and thirty typically developing children matched in age and non-verbal IQ were asked to predict when an occluded car would reach the end of a road and when an occluded set of lights would fill up a grid. We manipulated task difficulty by varying the occlusion duration (1s, 2s, 4s). Overall, children showed effects of occlusion duration, such that their performance became less precise for longer occlusion durations. However, autistic children made predictions that were just as precise and as reliable as those made by typically developing children, in both tasks. These findings challenge the theory that autism is caused by pervasively disordered prediction abilities. We will reflect on this theory, relative to Bayesian and predictive coding approaches, and suggest that more studies are required to test the predictions arising from theories of disordered prediction in autism.

SATURDAY, JANUARY 6

SYMPOSIA AND PAPER SESSIONS

REGULAR SYMPOSIUM 5

PERCEPTUAL AND DEVELOPMENTAL FOUNDATIONS OF ACTION-EVENT REPRESENTATION

Saturday, January 6, 13:00-14:30

Organizers:

Liuba Papeo, Institut des Sciences Cognitives Marc Jeannerod, CNRS, France

Melissa Kline, Massachusetts Institute of Technology, USA

Speakers:

Moritz Wurm, University of Trento, Italy

Liuba Papeo, Institut des Sciences Cognitives Marc Jeannerod, CNRS, France

Brent Strickland, Institut Jean Nicod, CNRS, France

Melissa Kline, Massachusetts Institute of Technology, USA

Entities and events are the two fundamental structures of the human conceptual space. While much has been learned about the representation of entities (i.e. “object knowledge”), much less is known about the representation of events.

An event is a set of entities that the human mind/brain readily interprets as a unitary thought, by capturing the binding between those entities. Thus, the study of event representation tackles the ability to infer non-perceptual relations among entities, a fundamental aspect of human intelligence. Yet, cognitive science is far from explaining how humans make inferences about abstract relations that only partly, or not at all, covary with spatial/perceptual relations. It remains unknown how early the representation of individual entities (e.g., two persons) become the representation of an event (e.g., fighting), and what drives the perception of a visual stimulus into the representation of an event, triggering the inferential operations toward action understanding. Finally, there is no agreement on how events –typically expressed in language with verbs– are acquired and which are the dimensions that define category membership within the representational space of events. The current symposium speaks to those questions, presenting recent advances from a range of methodological approaches on infants, children and adults. The first contribution by Moritz Wurm will set up the discussion by presenting recent results on the large-scale organization of the representational space for events. This work, based on decoding of information latent in neural activity, identifies two dimensions that drive the classification

SYMPOSIA AND PAPER SESSIONS

of events: sociality and transitivity. Determining the dimensions that establish event representations in the brain can offer converging evidence and, at the same time, guidance for investigation on how infants learn about events. In the second talk, Liuba Papeo will present results from research on adults and infants, suggesting the existence of perceptual mechanisms specialized to detect cues of interaction in complex (i.e., multi-person) scenarios. These mechanisms promote grouping of entities that enjoy a relation, giving rise to the earliest, embryonic representation of an event. In this perspective, the result of perception is a set of structured units, or functional groups, nearly ready for higher-level processing. Other perceptual properties of visual events, such as spatiotemporal properties of motion, appear fundamental to represent aspects of events such as causality. Brent Strickland will present research on adults and infants, which shows that causality is a perceptual property; it is accessed automatically during perception, before the occurrence of higher-level cognitive processes. Hence, perceptual specializations such as functional grouping and causality detection may contribute to accounting for how the human mind/brain solves a computationally demanding problem such as the visual analysis of interactions. Finally, Melissa Kline will present research on 3-4 year old children showing that distinctions between representations of events (e.g. causal versus noncausal), based on spatiotemporal patterns, reflected in children’s expectations about verb meaning. Thus, the current symposium will be a space to consider a triadic relationship between event perception, conceptual representation of events and language knowledge.

The representational organization of action events along features of sociality and transitivity

Moritz Wurm[1], Angelika Lingnau[2], Alfonso Caramazza[1,3]

[1]Center for Mind/Brain Sciences, University of Trento, Italy, [2]Royal Holloway University of London, [3]Harvard University and Center for Mind/Brain Sciences

A major goal in cognitive neuroscience is to understand how the human perceptual and memory systems organize distinct knowledge categories. While there is intense research on the organization of object knowledge, the neurocognitive principles of action categorization are largely unknown. Here we tested the hypothesis that certain category-specific action features are represented in distinct partitions in response to evolutionary pressure during the formation of neural substrates subserving action recognition. We focused on two potentially salient dimensions: the distinction between social (person-directed) vs. nonsocial and object-related vs. object-unrelated actions. We hypothesized that the

neuroanatomical representation of actions along these dimensions (sociality and transitivity, hereafter) is shaped by associations to category- specific object information (e.g., cutting is associated with tools and inanimate objects whereas teaching is associated with knowledge about conspecifics and interpersonal relations). Using fMRI-based multivoxel pattern analyses, we identified neural representations of observed actions in higher-level visual cortex (lateral occipitotemporal cortex, LOTC) that showed differential preferences for features of sociality and transitivity: Dorsal LOTC, in proximity to regions processing person knowledge, distinguished between social vs. nonsocial actions whereas ventral LOTC, in proximity to regions processing tools/artifacts, distinguished between transitive vs. intransitive actions. These findings point to a mutually dependent organization of actions and objects. Additionally, we found a posterior-to-anterior gradient from specific action subtypes to subtype- general categorical action information. Together, our results suggest specialized pathways that preferentially process socially relevant and tool/object-related action features, respectively, at increasing levels of generality and thereby provide the basis for understanding social and object-related actions.

The two-body inversion effect

Liuba Papeo

Institut des Sciences Cognitives Marc Jeannerod, CNRS, France

How do humans perceive visual scenes with multiple persons? I will discuss a series of visual perception experiments with backward masking, showing that processing of multiple bodies is influenced by their relative positioning. In particular, bodies facing each other (seemingly interacting) are recognized more accurately and faster than nonfacing bodies (noninteracting). Moreover, recognition of facing body dyads is disproportionately impaired when those stimuli are inverted. This pattern of results emerged even if participants are not able to report what they have seen (except that there were bodies), that is, before an elaborate, conscious recognition of body poses and actions. Privileged recognition and inversion effect reveal specialized mechanisms for the visual analysis of interacting bodies, analogous to the case of individual bodies and faces. These results open to the possibility of internal visual representations capturing configurations larger and more complex than an individual face or body (a dyadic configuration, at the least). Multi-body representations, where human observers would obtain a fast, initial appraisal of possible relations in a scene, may be the intermediate step between body perception and understanding of social interactions. In line with this thinking, initial results based on a preferential looking paradigm reveal sensitivity to facing versus nonfacing body positioning in 6-months-old infants. I will finally discuss results raising the question as whether the putative dyadic configuration is specific to human- human interaction or extends to human-object scenarios.

Automaticity in the perception of causality

Brent Strickland

Institut Jean Nicod, CNRS, France

For many years, following Michotte researchers believed that simple events, like billiard ball collisions, were in some cases “directly” seen as causal. In other words these event were postulated to be automatically categorized as involving causality in a way that may divorced from higher level judgment. In studying this phenomenon however, one issue has been the use of direct as opposed to indirect measures. Since the 1950’s, researchers interested in this topic have typically shown a causal or non-causal event to participants and asked them to assess the extent to which that event looks causal. This leaves open the possibility that any factors that are hypothesized to affect the perception of causality could in fact merely be affecting judgments about causality (Rips, 2011). Here I discuss a new sets of results involving indirect measures in the perception of causality and which help strengthen the argument that causal perception is automatic. The first involves a novel visual search task in which we show that physically impossible accelerations “pop-out” for causal launching events but accelerations do not do so for closely matched but non-causal events (Kominsky*, Strickland*, Wertz, & Keil, under review). We further show that similar effects obtain in pre-verbal infants from 10 months of age. Collectively these findings help demonstrate that causality is detected rapidly and automatically during online perception, and this can have surprising down stream effects.

How are events represented for language?

Melissa Kline

Massachusetts Institute of Technology, USA

How are events represented for language? Verbs appear to draw on a relatively small set of event components - Cause, Manner, Path, etc. (Talmy, 1985) – to define their syntactic

frames. Pre-linguistic infants are sensitive to causation and means/outcome (Gergely et al. 2002); if these lead to linguistic representations we expect verb meanings to reflect them. To test this, I examine 3-5yo's expectations about verbs and basic spatiotemporal event properties, showing that their verb meanings reflect general event components and properties of these early cognitive representations.

Causation: Preschools use a set of spatiotemporal cues (available to 6-month- old infants, Leslie & Keeble 1987) to guide verb learning in transitive sentences, a frame associated with causal meanings. Given a choice between a causal event and one identical except for the spatiotemporal cause/effect continuity, children map transitive verbs (but not intransitive ones) to the former.

Manner and Path: "I ran across the room" encodes Manner of motion in the verb, while "I crossed the room running" describes the same event with a Path verb. English-speaking preschoolers learn a Path bias from novel verb exemplars (after rise and enter they guess the next verb refers to cross, not run), but maintain the English manner bias when it fits the evidence. They extend this bias to causal scenes, interpreting verbs as either the action (hit) or effect (break) depending on the motion bias they learned.

This demonstrates access to abstract categories for the manner (of action, of motion) and outcome (paths, causal effects) of events.

PAPER SESSION 4

NON-HUMAN PRIMATE COGNITION

Saturday, January 6, 16:30-17:30

Chair:

Denis Tatone, Central European University, Hungary

Working memory in chimpanzees: Capacity, types of information, and sensitivity to interference

Christoph J. Völter[1,2], Josep Call[1,2], & Amanda M. Seed[1]

[1]University of St Andrews, UK, [2]Max Planck Institute for Evolutionary Anthropology, Germany

Working memory (WM) is a core executive function that allows organisms to hold, process, and manipulate information. Even though WM has been highlighted repeatedly as important factor contributing to uniquely human forms of cognition there is a surprising lack of WM paradigms for comparative research. In this study, we established a novel WM test in chimpanzees (Pan troglodytes). Standard WM tasks for humans often require participants to continuously update their WM. In experiment 1, we implemented this updating requirement in a foraging situation: chimpanzees (N = 9) searched for food items in an array of containers. To avoid redundant searches, they needed to continuously update which containers they had visited already. Depending on their individual performance, we raised the memory demands by adding containers to the search array. We examined chimpanzees' WM capacity and to what extent they used spatial and feature cues. In experiment 2, we investigated how susceptible their WM was to attentional interference, an important characteristic setting WM in humans apart from long-term memory. Overall, we found large individual differences with some individuals remembering at least their last four choices and younger chimpanzees generally performing better than older ones. Moreover, chimpanzees used a combination of spatial and feature cues to remember their previous choices. Finally, their WM performance decreased specifically when competing memory information was introduced. Together, these findings show remarkable similarities between human and chimpanzee WM abilities. Future studies will show how individual differences in WM performance relate to other executive functions in nonhuman primates.

Natural reference: comprehension of iconic gestures and sounds in children and great apes

Manuel Bohn[1,2], Josep Call[3], Michael Tomasello [4]

[1]Stanford University, USA; [2]Leipzig University, Germany; [3]University of St. Andrews, UK; [4]Duke University, USA

Iconicity plays an important role in theories on the developmental (e.g. Perniss & Vigliocco, 2014; Werner & Kaplan, 1963) and evolutionary (e.g. Cartmill et al., 2012; Tomasello, 2008) origins of human communication. In contrast to conventional/symbolic signals, such as words in a language, iconic signals resemble their referent and therefore bear a "naturally referential" relation to the things they denote. In a series of experiments, we investigated comprehension of iconic signals (gestures and/or sounds) in apes and human children (18-36mo). Participants played with two different apparatuses with an experimenter. Each apparatus was operated in a distinct way and made a distinct sound when operated. At a later point, the experimenter made reference to one of the apparatuses by mimicking its movement and/or its sound. We observed whether participants would approach the indicated apparatus. There were three conditions: combined (gesture + sound), gesture only and sound only. This allowed us to investigate the relative importance of different forms of iconicity. Apes and 18mo showed no signs of comprehension in the combined condition. 24mo children were able to spontaneously comprehend iconic signals in the combined condition, but not in the gesture or sound only conditions. At 36 month, children were successful in the combined and the gesture, but not the sound condition. The results will be discussed in light of the ongoing theoretical debate on the developmental and evolutionary origins of uniquely human communication. Taken together, these studies shed light on the flexibility of children's and apes' communication.

Object Individuation based on Property/Kind Information in Capuchin Monkeys

Verena Kersken, Da Zhang, Juan-Carlos Gomez, Amanda Seed, Derek Ball

University of St Andrews, UK

Object individuation is the cognitive ability to parse sensory input into discrete objects, according to spatiotemporal or property/kind information. Whereas human infants can use the former at a young age, they can only use the latter at around one year when language acquisition begins. Some researchers propose that the latter capacity, as a landmark of conceptual development, is correlated with language acquisition and therefore unique to humans, while others argue that nonhuman animals (apes and macaques) are also capable of using both types of information. The present study aimed to shed more light on the evolutionary origins of object individuation by testing a new-world monkey species, capuchin monkeys (Sapajus spp.), using both manual search (n = 29) and looking time (n = 25) measures. In spatiotemporal trials, subjects saw one or two objects dropped into a box, but always found (or saw) only one. In the property/kind trials, subjects saw either object A or B being dropped into a box and then always found (or saw) object A. The capuchin monkeys looked longer or searched more on unexpected trials – in which the outcome differed in quantity or in kind - which suggested that they had expectations based on object representations. We suggest that individuating objects according to their properties is likely a primate primitive. Similar to the work with infants in this paradigm, looking time and manual search measures gave convergent results.

REGULAR SYMPOSIUM 6

FROM SOCIAL TO MORAL: CHILDREN'S EVALUATIONS OF HOW PEOPLE UPHOLD THEIR PROSOCIAL OBLIGATION

Saturday, January 6, 17:30-19:00

Organizer:

Jonathan S. Beier, University of Maryland, USA

Speakers:

Jonathan S. Beier, University of Maryland, USA

Julia Marshall, Yale University, USA

Hyowon Gweon, Stanford University, USA

Reiki Kishimoto, Kyoto University, Japan Society for the Promotion of Science, Japan

Cooperative societies are sustained both by their members' prosocial concerns and by mechanisms for sanctioning those who do not share these normative attitudes. Although even infants view helpful people more favorably than those who do harm, these early social evaluations become moralized by adulthood. Helping is not just praiseworthy; in certain contexts, it is obligatory – and helpfulness itself is only virtuous when performed for the right reasons. Thus, a critical area for new research in social cognitive and moral development is how young children's social evaluations acquire the normative force of moral rules.

This symposium presents research examining young children's recognition of the prosocial obligations that one individual may have toward another, and their evaluation of people who do not uphold these norms. The first two talks describe developmental changes in children's evaluation of failures to help and comfort others. Talk 1 (Beier) documents children's emerging sensitivity to one person's inaction in the face of another person's need. Around 5 years, children begin to evaluate non-helpers negatively, as revealed through their play choices, attributions of niceness, and selective projection of other positive and negative characteristics. Talk 2 (Marshall) investigates children's appreciation for how prosocial obligations vary across different types of personal relationship. At 8 years, children view non-helping by a parent or friend as worse than non-helping by a stranger – yet 5-year-olds make no such distinctions. Talk 3 (Gweon) extends these considerations into a prosocial teaching context, finding that young children negatively evaluate teachers whose instruction is not well matched to the needs of a learner. An important insight provided by this work is that preschoolers' evaluations of whether a person has met a prosocial obligation are grounded in their awareness of what is possible: 4-year-olds penalize instruction by an under-informative teacher only if they have first experienced instruction by a more appropriately calibrated one. Yet prosocial obligations are more than a backdrop against which insufficient or inappropriate helpfulness can be judged; they reflect an expectation of genuine concern. Talk 4 (Kishimoto) reports that 4-year-old children negatively evaluate helpers who only act prosocially when others are watching. When self-enhancing reputational benefits appear to motivate an individual's prosocial behavior, it reveals awareness of one's prosocial obligations but also a failure to internalize them.

These talks originate from four different labs, working in two countries, and they examine children's recognition of prosocial obligations across multiple domains and helping contexts. Together, they reveal key developments in the transition from social to moral evaluation: Young children expect people to help others and censure those who do not, but they also recognize that helping norms are structured by personal relationships, that appropriate help must be sensitive to the needs of its recipients, and that helping is not a good index of character if it is only performed for personal benefit. Young children thus look beyond the inherently positive features of helping. They base their evaluations on whether people have upheld and internalized the prosocial obligations to which they are committed.

Preschoolers' Evaluations of People Who Do Not Help

Jonathan S. Beier, Brandon F. Terrizzi,

Amanda Mae Woodward, Jonas Ventimiglia

University of Maryland, College Park, USA

Moral theories support judgments about the rightness of actions and the goodness of actors. These intuitions are rooted in social evaluations appearing early in development: Even infants view helping as good and hindering as bad. Yet morality also prescribes what one ought to do; in some contexts, inaction itself is impermissible. We investigated the emergence of children's reasoning about one's prosocial obligation to help others, through their judgments of people who fail to meet this moral standard.

Three- to six-year-olds (N = 128) viewed two videos each. Children in the Helpful condition saw one actor help another access an out-of-reach object; those in the Unhelpful condition saw her observe the other's reach but do nothing. Children also viewed a baseline, no-

help-needed video, with new actors whose movements matched those in the main video. With age, children increasingly evaluated the helper more positively, and the non-helper more negatively, than each condition's matched baseline actor. This was expressed in their play choices and niceness ratings of each actor from 5 years of age, and their selective projection of positive (e.g., "always keeps promises") and negative (e.g., "never shares") qualities to the helpful, unhelpful, and neutral baseline actors by 6 years.

Young children thus negatively evaluate people who fail to help through inaction, and these judgments guide their social preferences. Children increasingly consider what a person should have done, suggesting that their evaluations incorporate normative standards for prosocial responding. Ongoing work examines children's consideration of external factors that limit one's ability to help.

Children's and Adults' Evaluations of Social Roles and Acts of Omission

Julia Marshall, Paul Bloom

Yale University, USA

Adults not only morally judge actions; we morally judge omissions. A parent who refused to help his injured child, or someone who did not answer her friend's cry to help, might be judged harshly, as a bad person. But such obligations are attenuated by relationships; we are less prone to blame a stranger for doing nothing. The present studies explore the development of these intuitions. In Study 1, we told 8- and 9-year-olds (n = 42) and adults (n = 45) stories about a child in need, where either a parent, a friend, or a stranger failed to help. Children and adults rated the parent's inaction the most harshly, the stranger's the least, and the friend in between. In Study 2, we carried out a simplified version of this experiment, and tested younger children as well. 8- and 9-year-olds (n = 43) and adults (n = 34) showed the same effect as in Study 1. But 5- and 6-year-olds (n = 40) evaluated inaction across the different characters as uniformly negative—for them, it is just as bad for a stranger to fail to help than for a parent to do nothing. Ongoing studies are exploring the nature of this developmental difference.

Beyond Avoiding People Who Are Wrong: Young Children's Evaluation of Others' Informativeness

Hyowon Gweon, Mika Asaba

Stanford University, USA

Pedagogical contexts license learners to draw powerful inferences, yet such power can become hazardous when teachers provide misleading information. Thus, it is critical for young learners to evaluate teachers who are unhelpful.

When a teacher demonstrates one function of a toy that has three other functions, this under-informative teaching constitutes a "sin of omission"; it misleads the learner to falsely believe that the toy has just one function even though her demonstration was never technically false. Here we test the hypothesis that, even though preschool-aged children have the competence to evaluate under-informative teaching, their performance depends on whether they understand what the teacher could have done to be fully informative. Children evaluated two teachers (one fully informative, one under-informative) in two different orders. While 6- and 7-year-olds penalized the under-informative teacher regardless of the order (Exp.1), 4- and 5-year-olds did so only when they rated the fully informative teacher first. Exp.3 and Exp.4 provide further evidence that preschoolers need an explicit example of fully informative teaching to recognize omission as a "sin". Additional studies show that preschoolers exonerate under-informative teaching if the teacher couldn't be more informative due to her ignorance, and even understand that the same information can be necessary or excessive (over-informative) given the learner's knowledge.

Collectively, this talk will highlight how young learners go beyond simply avoiding people who are wrong. Children actively infer others' qualities as teachers based on whether they provide information that is requisite to the needs and the expectations of a learner.

Preschoolers' Social Evaluations of Others' Strategically Public Displays of Prosocial Behavior

Reiki Kishimoto[1,2], Shoji Itakura[1], Kazuo Fujita[1], Kazuhide Hashiya[3]

[1]Kyoto University, Japan, [2]Japan Society for the Promotion of Science, Japan, [3]Kyushu University, Japan

Behaving cooperatively only when it enhances one's reputation is a strategy that brings personal benefits at minimal cost. However, if others notice that an individual is employing such a strategy, the reputational benefits may be collapsed. We addressed the developmental origin of this type of social judgment by examining how 4- to 5-year-olds evaluate "calculating" agents. In Experiment 1, children preferred the Private-only Helper, who helped another individual only when he believed he was not being observed, compared to the Public-only Helper, who helped only when he knew that he was being observed – even though their helping frequency was equal across contexts. Experiment 2 was a modified version of the procedure, conducted with adults. Not only did adults show the same preference as children, but further testing also suggested that they evaluated the Public-only Helper more negatively than an Unconditional Non-Helper, who never helped at all. Moreover, outside of a calculating strategy, helping frequency did matter, as they preferred the Unconditional Helper, who always helped, to the Private-only Helper. Experiment 3 thus explored whether children also ignore helping frequency when evaluating calculating agents. Unlike adults, children showed no clear preference.

Overall, we have demonstrated that an avoidance of calculating agents is already present in 4-year-old children. Although young children's evaluations are not yet completely independent of helping frequency, they already appear to distinguish between people who help out of genuine altruistic tendency and people who help to gain personal reputational benefits.

SYMPOSIA AND PAPER SESSIONS

POSTER SESSION A
THURSDAY

PA - 001 Can infants represent alternative possibilities? A pupillometric investigation of infants' representation of the possible

Nicoló Cesana-Arlotti, Ernő Téglás

Central European University, Budapest, Hungary

PA - 002 Cooperation exceeds competition in turning preschool children into flexible perspective takers

Pengchao Li, Xinyi Jin, Jie He

Zhejiang University, China

PA - 003 False belief understanding is associated with gray matter maturation in the TPJ in preschool age

Charlotte Grosse Wiesmann, Nikolaus Steinbeis, Angela D. Friederici, Tania Singer

Max Planck Institute for Human Cognitive and Brain Sciences, Germany

PA - 004 Preschool metacognitive developments allow learning and use of co-referential words

Theodora Karadaki, Martin Doherty

University of East Anglia, UK

PA - 005 Negative affectivity is related to differential neural responses to social stimuli in infants

Anne van der Kant, Szilvia Biro, Claartje Levelt, Stephan Huijbregts

Leiden University, Netherlands

PA - 006 The effect of classroom noise on creativity in primary school children

Jessica Massonnié, Catherine Rogers, Denis Mareschal, Natasha Kirkham

Birkbeck, University of London, UK

PA - 007 Children prioritize prior background knowledge over story information during real-time linguistic processing

Ruth Lee[1], Craig G. Chambers[2], Patricia A. Ganea[2]

[1]University of Toronto, Canada, [2]University of Toronto Mississauga, Canada

PA - 008 At the interface of emotion regulation and cognitive regulation

Niamh Oeri, Claudia M. Roebers

University Bern, Switzerland

PA - 009 Exploring third-party punishment in primary school-aged children: Links to normativity, development and parenting

Rhea Arini, Luci Wiggs, Ben Kenward

Oxford Brookes University, UK

PA - 010 Sensitivity to Subject-Verb agreement with conjoined subjects: the developmental trajectory in French-learning toddlers between 18 and 30 months of age

Elena Koulaguina[1,2], Géraldine Legendre[2], Isabelle Barrière[3], & Thierry Nazzi[1]

[1]Université Paris Descartes & CNRS, France, [2]Johns Hopkins University, USA, [3]Long Island University, USA

PA.e - 011 What pursuit eye movements reveal about infants' understanding of bouncing motion

Matus Simkovic, Birgit Träuble

Universität zu Köln, Germany

PA.e - 012 Estimating Variability and Accuracy in Remote Mode Infant Eye Tracking

Karola Schlegelmilch, Annie E. Wertz

Max Planck Institute for Human Development, Germany

PA - 013 Developmental changes in temporal focus

Patrick Burns[1], Agnieszka Jaroslawska[2], Áine Fitzpatrick[1], Eugene Caruso[3],Teresa McCormack[1]

[1] Queen's University Belfast, UK, [2] University of Edinburgh, UK, [3] University of Chicago, USA

PA - 014 Children use expected value to avoid unnecessary risk

Teresa Harvey, Peter R. Blake

Boston University, USA

PA - 015 Do human infants use vocal pitch cue for predicting dominance of a character over another?

Seyyed B. Borgheai, Erik Cheries

University of Massachusetts Amherst, USA

PA - 016 Toddlers' eye-movements reflect (un)certainty about their knowledge of a word's meaning

Isabelle Dautriche[1], Louise Goupil[2], Kenny Smith[1], Hugh Rabagliati[1]

[1]University of Edinburgh, UK, [2]IRCAM, France

PA - 017 Strategic reputation management: Children adjust their sharing behavior in accordance with an observer's mental state

Asami Shinohara[1,2,3], Yasuhiro Kanakogi[2,3], Masako Myowa[4]

[1]Nagoya University, Japan, [2]NTT Communication Science Laboratories, Japan, [3]Japan Society for the Promotion of Science, Japan, [4]Kyoto University, Japan

PA - 018 Perspective-taking as a developmental precursor of metacognition: A longitudinal study

Daniela Kloo, Markus Paulus, Susanne Kristen, Sunae Kim, Beate Sodian

Ludwig-Maximilian-University, Germany

PA - 019 The effects of consonant and dissonant music on prosocial behaviors of preschool children and cockatiels (Nymphicus hollandicus)

Uyen Tran, Carla Aimé, Mathilde Le Covec, Dalila Bovet, Rana Esseily

Laboratoire Ethologie Cognition Développement, France

PA.e - 020 Do pragmatic language skills relate to friendly and pretend play behaviours?

Silvana Mareva, Pablo Torres, Elian Fink, Jenny Gibson

University of Cambridge, United Kingdom

PA - 021 Investigating the effect of contextual and personal factors on preschoolers' allocation behavior

David Buttelmann

University of Bern, Switzerland

PA - 022 Children's Questions in Cross-Cultural Perspective and Their Role in Cognitive Development

Mary Gauvain[1], Robert L. Munroe[2]

[1]University of California, Riverside, USA, [2]Pitzer College, USA

PA.e - 023 Infants' index-finger pointing frequency is related to their point-following beyond immediate visual field

Ebru Ger[1,2], Sura Ertaş[3], Setenay Evsen[4], Göksu Gülpınar[4], Aylin Küntay[1]

[1]Koç University, Turkey, [2]University of Zurich, Switzerland, [3]Istanbul University, Turkey, [4]Bilkent University, Turkey

PA - 024 The Social Motivation behind Overimitation Across Cultures

Roman Stengelin, Robert Hepach, Daniel Haun

Leipzig University, Germany

PA - 025 Sampling the present to guide future choices in long-tailed macaques

Sarah Placì[1,2,3], Hannes Rakoczy[2,3], Julia Fischer[1,2,3]

[1]German Primate Center, Germany, [2]Leibniz Science Campus Primate Cognition, Germany, [3]Georg-August-University of Göttingen, Germany

PA - 026 Association between infant mother sleep-wake pattern and language development

Kazuko Yonei, Kazuo Hiraki

The University of Tokyo, Japan

PA.e - 027 Overhypothesis Formation in Capuchin Monkeys (Cebus apella) and Children

Elisa Felsche[1], Patience Stevens[2], Christoph Völter[1], Daphna Buchsbaum[3], Amanda Seed[1]

[1]University of St Andrews, UK, [2]Carnegie Mellon University, USA, [3]University of Toronto, Canada

PA.e - 028 Two-year-old children show flexibility in immediate re-enactment but not in memory retrieval in a delayed imitation paradigm

Krisztina Peres[1], Dóra Kampis[2], Ildikó Király[1]

[1]Eötvös Loránd University, Hungary, [2]Central European University, Hungary

PA - 029 Social and psychological contexts for tool-innovation

Sarah R. Beck[1], Clare Whalley[1], Nicola Cutting[2], Louise Bunce[3]

[1]University of Birmingham, UK, [2]York St John University, UK, [3]Oxford Brookes University, UK

PA - 030 Evolutionary roots of social comparison processes: effects of task relevance and competition on task performance in long-tailed macaques

Stefanie Keupp[1], Thomas Mussweiler[2], Thomas Bugnyar[3], Julia Fischer[1]

[1]German Primate Center, Germany, [2]London Business School, UK, [3]University of Vienna, Austria

POSTER SESSION A THURSDAY

PA - 031 Preschoolers retrospectively reevaluate word meanings provided by an unreliable informant

Elena Luchkina[1], Kathleen Corriveau[2], David Sobel[1]

[1]Brown University, USA, [2]Boston University, USA

PA - 032 Nuances of "we": the effect of utterance contexts on the distribution task performances in children with/without ASD

Kazuhide Hashiya[1], Hiromi Kobayashi[1], Kazuki Maeyama[1], Hiroshi Nitta[1], Kei-ichiro Hakarino[2], Yoshikuni Tojo[3], Toshikazu Hasegawa[4]

[1]Kyushu University, Japan, [2]Musashino Higashi Center for Education and Research, Japan, [3]Ibaraki University, Japan, [4]University of Tokyo, Japan

PA - 033 Finding an emotional face in the kindergarten

Virág Ihász, András Zsidó

University of Pécs, Hungary

PA - 034 Infants' understanding and using of emotional information from others

Yuseung Suk, Shoji Itakura

Kyoto University, Japan

PA - 035 Use of communicative gestures in completely nonverbal children with autism

Dominika Slušná[1], Wolfram Hinzen[1,2,3], Joana Rosselló[4], Andrea Rodríguez[5], Berta Salvadó[5]

[1]Universitat Pompeu Fabra, Spain, [2]Institució Catalana de Recerca i Estudis Avançats, Spain, [3]FIDMAG Germanes Hospitalaries Research Foundation, Spain, [4]Universitat de Barcelona, Spain, [5]Centro de Orientación y Asistencia al NeuroDesarrollo Infanto-Juvenil, Spain

PA.e - 036 Does exploratory behavior encourage successful and creative tool innovation?

Emily R R Burdett[1,2], Samuel Ronfard[3], Ivana Hezelyova[4], Malinda Carpenter[4]

[1]University of Oxford, UK, [2]Coventry University, UK, [3]Boston University, USA, [4]University of St Andrews, UK

PA.e - 037 Young infants' teleological representations of cooperative vs. competitive goal-pursuit

Liza Vorobyova, Erno Teglas, Gyorgy Gergely

Central European University, Hungary

PA - 038 Conformity in Children in a Culturally Diverse Country

Anne Sibilsky[1], Heidi Colleran[2], Daniel Haun[1]

[1]University of Leipzig, Germany, [2]Max PLanck Institute for the Science of Human History, Germany

PA - 039 Towards a unified understanding of self-regulation: Interrelations between Executive Function, Metacognition, and Effortful Control in preschool children

Sonja Kälin, Nike Tsalas, Claudia M. Roebers

University of Bern, Switzerland

PA - 040 Redefining Minimal Mindreading

Brandon Tinklenberg

York University, Canada

PA - 041 A parental questionnaire for infants' early communication abilities at the age of 8-10 months – the German "Baby-Komm"

Silke Fischer[1], Iris Nomikou[2], Angela Grimminger[1], Katharina Rohlfing[1]

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PA - 042 Studying Subjective Experiences in Infants: A Case Study from the Developing Sense of Agency

Lorijn Zaadnoordijk, Sabine Hunnius

Radboud University, Netherlands

PA - 043 Does inhibitory control and group membership influence young children's preferences for the distribution of resources?

Reka Kassai, Zsofia K. Takacs, Judit Futo

Eotvos Lorand University, Hungary

PA - 044 The effects of mindfulness meditation on children's executive functioning: A meta-analysis

Boglarka Vekety, Reka Kassai, Alexander N. H. Logemann, Zsofia K. Takacs

Eotvos Lorand University, Hungary

PA - 045 Infant vocal imitation of infant-directed singing

Lucia Benetti, Eugenia Costa-Giomi

Ohio State University, USA

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PA - 046 Words, hands or looks? Understanding teaching strategies in children with cochlear implants

Luciana Lucchina[1,2], Nicole Pochinki[2,4], Ariel Haimovici[1,2], Percival Denham[3], Mariano Sigman[1,2], Cecilia Inés Calero[1,2]

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PA.e - 047 Do children imitate robots?

Hanna Schleihauf[1,2], Neli Tsvetkova[1], Alexander König[1], Katja Mombauer[1], Stefanie Hoehl[2,3], Sabina Pauen[1]

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PA - 048 Children's long-term learning from linguistic in-group and out-group members

Eszter Endrődi[1], Katalin Oláh[1], Ildikó Király[1,2]

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PA - 049 The comprehension of existential negation and denial in 18 and 15-month-olds

Eszter Szabó, Ágnes Melinda Kovács

Central European University, Hungary

PA - 050 Neural markers of adaptation in children at high- and low- risk for autism spectrum disorders (ASD)

Emma Ward[1], Jan K Buitelaar[1,2], Ricarda Braukmann[1,2], Sabine Hunnius[1]

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PA - 051 The influence of mutual manifestness of partner's costs on prosocial choices in 6- to 8-year-old children

Francesca Bonalumi, Gergely Csibra, Christophe Heintz

Central European University, Hungary

PA - 052 Neural substrates of false belief processing at the transitional stage (3-5-year olds): fNIRS study

Maciej Haman, Agnieszka Pluta, Joanna Wysocka

University of Warsaw, Poland

PA - 053 Modal Markers and Shared Thinking in Early Education

Frauke Hildebrandt [1], Karoline Lohse [1], Andrea Hildebrandt [2]

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PA.e - 054 Scaffolding Young Children's Experimentation on the Balance-Scale

Johanna van Schaik, Maartje Raijmakers

Leiden University, Netherlands

PA - 055 Effects of a short mindfulness based intervention on preschoolers' executive functions

Adam Koncz, Zsolt Demetrovics, Zsofia K. Takacs

Eötvös Loránd University, Hungary

PA - 056 Moral judgments stick within the family

Niklas Dworazik[1], Joscha Kärtner[1], Leon Lange[2], Moritz Köster[1,3]

[1]University of Münster, Germany, [2]University of Wuppertal, Germany, [3]Freie Universität Berlin, Germany

PA - 057 The Use of Episodic and Semantic Memory Systems in Classroom Context

Nur Elibol-Pekaslan, Basak Sahin-Acar

Middle East Technical University, Turkey

PA - 058 Age-related cognitive strategy changes in implicit sequence learning

Noémi Éltető[1], Dezső Németh[1,2]

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PA - 001 Can infants represent alternative possibilities? A pupillometric investigation of infants' representation of the possible

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Contrasting possibilities has a great adaptive value for prediction and learning. The literature, however, is ambivalent about the developmental path of this capacity: on the one hand, findings suggest that even children might have trouble in generating foraging strategies taking into account mutually exclusive possibilities, while, in contrast, in other studies, infants' exploratory looking suggests an early understanding of alternative future outcomes.
We investigate pupil dilation reflex as a potential window on infants' representation of alternative possibilities. In this experiment 10 and 14-month-old infants saw video-animations presenting an object identification task. The central element of the stimuli was a large occluder in form of H: two objects were hidden behind one lateral occluder and one object on the opposite side. Shortly after the hiding, one of the objects emerged from one location but remained only partially visible, without displaying its identifying features. We expect that this partial information triggers the representation of the alternative possible identities of the object. In half of the trials, the object emerged from the one-object location, in the other half from the two-objects location. With an eye-tracker, we measured variation in infants' pupil diameter while they were observing the partially visible object. Adults pupil diameter increases monotonically with the amount of information held in memory. We expected similar effects if infants represent multiple possibilities. We found that the older infants reacted with a higher increase in pupil diameter in the two-objects condition, while the younger ones did not.

PA - 002 Cooperation exceeds competition in turning preschool children into flexible perspective takers

Pengchao Li, Xinyi Jin, Jie He
Zhejiang University, China

Visual perspective taking (VPT), the ability to reason about what other people see, plays a critical role in our social life. While researchers have paid much attention on the relationship between age and VPT, little is known about how social interaction affects this ability on children. In the current study, two experiments were carried out to find out if a short period of cooperation or competition would affect 4-year-old children's perspective confronting (a flexible high-level perspective taking, which requires children to report what color of the same blue pictures they and adults see through (or not through) the color filters) (Moll et al. 2013). Experiment 1 (N = 48) found that children who cooperated with an adult were more capable of taking others' confronting perspective than their peers who competed against the adult. The priming effect was replicated with an improved edition of the perspective confronting task in Experiment 2, and baseline data of children's performance

were also collected. Experiment 2 (N = 72) further clarified that (1) 4-year-old children still have some difficulty understanding confronting perspectives both in baseline and competitive groups, and (2) compared to baseline, cooperation, while not competition, helped them with perspective confronting significantly. Taken together with previous studies concerning the influence of social interaction on desire understanding (Jin et al. 2016), the current finding added up to our knowledge about how social interaction shapes one's theory of mind.

PA - 003 False belief understanding is associated with gray matter maturation in the TPJ in preschool age

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Max Planck Institute for Human Cognitive and Brain Sciences, Germany

Decades of research assumed that Theory of Mind emerges around the age of 4 years, when children start passing traditional explicit false belief tasks. Recently, however, novel false belief paradigms have shown that already infants younger than 2 years display correct expectations of the actions of an agent with a false belief. Yet, the processes underlying these infant false belief tasks and their relation to the traditional explicit false belief tasks are not understood to date. Here, we related measures of gray matter brain maturation assessed with magnetic resonance imaging (MRI) in 3- and 4-year-old children with their false belief performance in an infant anticipatory looking false belief task and in traditional explicit false belief tasks. This showed that cortical thickness in the brain regions known to support belief processing in adults, in particular, in the temporoparietal junction (TPJ), was associated with children's performance in the traditional explicit, but not in the infant false belief task. These findings support of a dissociation of the abilities measured by infant and traditional explicit false belief tasks, in line with previous behavioral and white matter findings.

PA - 004 Preschool metacognitive developments allow learning and use of co-referential words

Theodora Karadaki, Martin Doherty
University of East Anglia, UK

Children frequently avoid using two labels for the same referent. For example, if taught two words for the same object, children select distractors for one of these words at test. Here we demonstrate that metacognitive immaturity until 4 years accounts for this phenomenon. Three- to 6-year-old children (N = 126) were taught two novel labels for a novel object in separate situations by two experimenters. Then each experimenter asked the child to select the object using the name they had taught. In two experiments, younger children incorrectly chose distractors for the second label tested. The ability to select the same target for each name was associated with false belief understanding and other tests of dual label understanding; associations remained robust after controlling for age and verbal mental age ($r > 0.66$, $p < .001$). Post-tests showed that children correctly selected the target when

only one of the novel words was used, even when they had previously selected the distractor for that word. We argue that this and other 'mutual exclusivity bias' phenomena demonstrate difficulties using co-referential terms in the same conversation, and are not about word learning as such.

PA - 005 Negative affectivity is related to differential neural responses to social stimuli in infants

Anne van der Kant, Szilvia Biro, Claartje Levelt, Stephan Huijbregts
Leiden University, Netherlands

A recent series of fNIRS studies has shed light on the cortical specialization for social information processing by robustly demonstrating the involvement of the posterior temporal lobe (e.g. Lloyd-Fox et al, 2009). The sensitivity of the neural correlates of social perception to genetic and environmental factors however is less explored. We investigated the impact of infant temperament, namely Negative Affectivity, on cortical specialization for processing social dynamic stimuli. Negative Affectivity during infancy comprises behaviors such as frustration, sadness, social fear and poor soothability and has been associated with social-cognitive development and behavioral problems.
Thirty-seven 5-8 months old infants provided usable fNIRS data. Our paradigm was identical to that of used in Lloyd-Fox et al' study (2009). In a block design, infants watched video clips of Social dynamic and Non-social dynamic stimuli with baseline stimuli in between. Four sources and four detectors on each hemisphere with a source-detector separation of 20 mm were used defining overall 20 channels over frontal and temporal cortices. Negative affectivity was assessed by parental report using the Infant Behavior Questionnaire.
Results showed significantly larger blood-oxygenation changes in the right posterior-temporal region in the social dynamic compared to the non-social dynamic condition ($t=3.15$, $p=.006$). Furthermore, this differential activation was smaller in infants showing higher Negative Affect ($r=-.58$, $p=.007$). Our results thus replicate previous findings on cortical specialization for social perception. Furthermore, the decreased cortical sensitivity to social stimuli in infants showing high Negative Affect may be an early biomarker for later difficulties in social interaction.

PA - 006 The effect of classroom noise on creativity in primary school children

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During a regular school day, pupils are exposed to 72dB of noise on average (Shield & Dockrell, 2004). Following adult findings (Mehta, Zhu & Cheema, 2012), we investigated whether classroom noise promotes children's creativity, and whether general cognitive skills, working memory, and attentional control play a role in this effect.
Forty-four children (age range: 4.92-11.33 years; M = 8.17) were prompted to find unusual uses of a pencil/bottle (AUT) and to suggest consequences of two imaginary situations (JS). Each pupil performed these creativity tasks twice: in silence, and under 65dB of classroom noise. The number of ideas (fluency), categories (flexibility) and originality were measured. Children's general abilities (vocabulary, nonverbal reasoning), attentional control (animal Stroop, Flanker), visuospatial and verbal working memory were assessed in silence.
Noise had a main negative effect on JS Fluency, Flexibility and Originality scores, but not on the AUT. The effect of noise did not interact with general abilities, but was related to attentional control in a non-linear way. Children with low or high Stroop scores tended to give more original ideas for JS in silence. Those performing better under noise were having average Stroop scores. Similarly, participants giving more flexible ideas at the AUT under noise had average Flanker scores. However, few children with low attentional control were also better in noise. Finally, high visuospatial memory scores were marginally associated with better Flexibility at JS under noise.
To summarise, results suggest a negative effect of classroom noise on specific creativity tasks, partly modulated by attentional control.

PA - 007 Children prioritize prior background knowledge over story information during real-time linguistic processing

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Using real-time eye-movement measures, Lee, Chambers, Huettig, & Ganea (2017) found that 7-year-olds have difficulty using a fantastical story context to override stored semantic relationships when interpreting a sentence. We ask whether generic language, which implies a universal truth, enhances children's mental representations of discourse events.
Brief stories were presented on an eye-tracker. In Experiment 1, every trial introduced a character from a familiar category (e.g., 'This is Chloe the fairy'. Four trials referred to the unusual actions of this individual ('Chloe the fairy doesn't have cake for her snack. She has snow for her snack! And she doesn't put her shirts in the laundry. She puts her radio in the laundry!'), and 4 trials used generic language to attribute these actions to a category ('Fairies don't have...) During the critical sentence ('Chloe is eating up the snow') all four mentioned items were displayed. The proportion of participants' looking time to each item was measured between verb onset and noun onset. Contrary to expectation, children looked longer to the semantically congruent item (e.g., cake) on generic than non-generic language trials, and did so for longer than adults. Experiment 2 employed novel fantastical characters. Regardless of language type, children and adults both used semantic knowledge and discourse information. These results suggest that for children, background knowledge about characters (e.g., fairies cast spells) is activated by generic language and overrides story information during moment-by-moment sentence interpretation; in the absence of background knowledge, generic language does not enhance the salience of story information.

PA - 008 At the interface of emotion regulation and cognitive regulation

Niamh Oeri, Claudia M. Roebers
University Bern, Switzerland

Self-regulation skills are a hallmark of early childhood development and involve multiple self-regulation components. The aim of the present study was to experimentally approach the interplay between emotion regulation and cognitive regulation in kindergarten children. There were two experimental conditions: Whereas the control condition (n = 74) required cognitive regulation, the experimental condition (n = 75) required not only cognitive regulation but also emotional regulation. The results showed that regardless of the additional emotional demands for the experimental condition, cognitive performance did not vary between the two conditions. However, further analyses revealed that depending on the self-regulation demands, the involved processes differed. Whereas executive functions predicted performance in the cognitive regulation condition, global self-regulation abilities predicted performance in the cognitive-emotional interplay condition. The results suggest that if self-regulation demands are high (i.e., involve multiple self-regulation components), self-regulation components operate in a compensatory fashion, jointly allowing for appropriate cognitive performance.

PA - 009 Exploring third-party punishment in primary school-aged children: Links to normativity, development and parenting

Rhea Arini, Luci Wiggs, Ben Kenward
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Third-party punishment (i.e. punishment of wrongdoers by unaffected bystanders rather than victims of the norm violation) is considered a key factor in sustaining large-scale human cooperation. Whilst research on adults' punishment is plentiful, little is known about the development of punitive behaviour in children.
The current study was aimed at establishing to what extent children's third-party punishment differs in response to different types of norm violations, changes over development and is affected by parenting styles.
Children between the ages of 5-11 years were shown a computer game in which they were required to judge internet players' behaviour by acting as referees. The players violated norms in one of two moral domains, loyalty or fairness. Children were then offered the opportunity to choose the type of punishment – social or economic – to assign to the immoral players within the game, as well as the severity of punishment. In parallel parents were asked to complete a questionnaire about their attitudes to disciplining children.
Analyses revealed that children made the punishment fit the crime in terms of moral domains: children witnessing violations of fairness norms were more likely to assign economic punishment, while children witnessing violations of loyalty norms were more likely to assign social punishment. Contrary to our predictions, this behavioural pattern did not change as a function of age. Moreover, in contrast with previous studies, children's severity in assigning punishment decreased with age. Finally, children's severity was negatively predicted by parents' severity but this correlation did not survive controlling for parental education.

PA - 010 Sensitivity to Subject-Verb agreement with conjoined subjects: the developmental trajectory in French-learning toddlers between 18 and 30 months of age

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We examined the development of toddlers' sensitivity to Subject-Verb (SV) agreement with conjoined subjects. In languages like English and French, a conjoined NP triggers plural agreement even when made up of individual singular NPs. Its processing requires going beyond surface patterns of non-adjacent dependencies to abstract, feature-based syntactic knowledge. In Experiment 1, we tested 18- and 24-month-olds in a Head-Turn Preference Procedure task, with grammatical and ungrammatical utterances containing two singular NPs. In the Conjoined condition, the two singular NPs prosodically formed a single conjoined subject. In the Disjoined condition, the two singular NPs were separated by a clausal prosodic boundary. The Disjoined condition controlled for children's potential preference for plural verb forms, irrespective of agreement. Results revealed a significant grammaticality effect in 24-month-olds, with no interaction with the condition. A detailed analysis of the 24-month-old data showed that in the Conjoined condition the effect was limited to the first half of the experiment, whereas in the Disjoined condition, the effect was spread throughout the whole experiment. In Experiment 2, we tested 30-month-olds (the earliest age of comprehension with simple subjects; Legendre et al., 2010) with the Conjoined condition only. Thirty-month-olds showed the same pattern of results as 24-month-olds: a strong grammaticality effect limited to the first half of the experiment. Overall, these results suggest that both 24- and 30-month-old (but not 18-month-old) children have abstract knowledge of SV agreement with conjoined subjects. Importantly, their abstract syntactic knowledge at 24 months precedes the earliest evidence of comprehension.

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PA.e - 011 What pursuit eye movements reveal about infants' understanding of bouncing motion

Matus Simkovic, Birgit Träuble
Universität zu Köln, Germany

Pursuit eye movements are intervals of steady smooth eye movement when the gaze velocity matches the velocity of the target and the gaze tracks the target. Infants start to use pursuit eye movement at the age of 2 months (Aslin, 1981). Adult studies have shown that the onset, duration and velocity of pursuit eye movements are affected by the observer's knowledge and her expectations about the target movement (Barnes, 2008). In particular, if the target hits a barrier and bounces off, the gaze disengages from the target prior to contact and aligns with the target's expected position after the target's contact with the barrier. In a longitudinal study with 4, 7 and 10 month old infants we used pursuit eye movements to study infant's expectations about the object's movement change after a contact with a barrier. To this end we presented infants with two dimensional depictions of a circle bouncing off the inner edge of the computer screen on which the movement was presented. For each infant, the impact angle and the velocity of the target was varied across repeated presentations. We evaluated whether and how the velocity and the alignment with the gaze point changed immediately prior to the contact with the barrier. We further investigated how the expectations vary depending on the age of the observer and the velocity of the target. Data collection is under way. Results of a sample of ca. 80 infants will be presented and discussed.

PA.e - 012 Estimating Variability and Accuracy in Remote Mode Infant Eye Tracking

Karola Schlegelmilch, Annie E. Wertz
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Eye tracking with infants has become a common method to investigate a multitude of phenomena concerning infant cognition. However, fussiness caused by the repetition of calibration stimuli and body movements during testing are frequent constraints on measurement quality. Here, we systematically investigated these constraints with 29 infants (8 - 12 months of age) and 25 adults using EyeLink® 1000 Plus. Both groups performed several tasks that allowed us to compare looking time and dispersion of gaze points elicited by stimuli resembling commonly used calibration animations. The adult group additionally performed a variety of body movements during gaze recording, equivalent to movements that infants spontaneously produce during testing. In our results, infants' preference for a particular calibration target did not predict precision after calibration, but targets with globally distributed complexity or targets that exhibit the strongest contrasts in their centre resulted in the highest recording precision. Our gaze measures from the adult movement tasks were differentially affected by the type and direction of head movement as well as the attended screen location. Specifically, movement towards the screen resulted in lower dispersion during a fixation, but increased measured gaze distance to targets. Following the stimuli with head turns resulted in low overall precision and reduced accuracy especially at peripheral screen locations. These heterogeneous effects of movement on measures should be taken into account when planning infant eye tracking experiments. Additionally, to improve data quality, infants' commitment to repeated calibrations can be enhanced by alternating between precise calibration targets.

PA - 013 Developmental changes in temporal focus

Patrick Burns[1], Agnieszka Jaroslawska[2], Áine Fitzpatrick[1], Eugene Caruso[3],Teresa McCormack[1]
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The burgeoning field of mind-wandering research indicates that adults spend considerably more time thinking about the future than the past. This finding is taken as evidence that adults have a future-oriented temporal focus, where temporal focus refers to the relative amount of time individuals spend thinking about past, present and future. However, very little is known about children's mind-wandering. Temporal focus is interesting developmentally because children are often considered to be less future-oriented than adults. We assessed developmental changes in temporal focus using two tasks. Children aged 6-to-7, 9-to-10, adolescents (14-15 years), and adults completed a mind-wandering task in which past, present, and future oriented thoughts were sampled during an unrelated undemanding task. Second, participants completed a cued mental time travel task in which they were asked to report an event associated with a target word – participants were free to report an event either from the future or past. Both tasks showed age-related differences in the tendency to engage in future-oriented thought. Adults but not children engaged in more future-oriented thought than past-oriented in the mind-wandering task and adults generated significantly more future episodes in the cue-word task. Although future-oriented thought has been characterized as more cognitively demanding than past-oriented thought, we found no evidence of a relation between working memory capacity and participants' tendency to focus on the future. We discuss the developmental relation between the emerging asymmetry in temporal focus and a number of other past-future asymmetries in judgments and emotions that we have been investigating.

PA - 014 Children use expected value to avoid unnecessary risk

Teresa Harvey, Peter R. Blake
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When facing risky choice problems, preschool children tend to favor gambles over certain choices and show similar levels of risk-taking for gains and losses (Reyna & Ellis, 1994; Levin et al, 2007; Boyer, 2006). However, it is unclear whether young children favor the larger rewards typically offered in gambles or whether they fail to determine the expected value (EV) of the gamble compared to a

certain outcome. We asked 4-10 year olds (N=114) to choose between a gamble and a certain outcome for four trials (within subjects) to earn tokens to purchase prizes. All gambles used a pinwheel with 50% probability. In two trials, the certain outcome was the EV of the gamble, allowing a determination of baseline preference. Two other trials had unequal EVs: favoring risk (2 vs 0 or 8) and favoring certainty (4 vs 0 or 6). Children received the trails as gains or losses (between subjects). When the EV was equal, younger children favored risk for both gains and losses, as previously reported. However, when EV was not equal, children at all ages used EV appropriately, switching between the gamble and certain outcomes for gain and loss in order to maximize income: for 2 vs 0-8, 88% risky choices for gain, 56% for loss, $F(1,111) = 10.7$, $p < .001$; for 4 vs 0-6, 57% risky choices for gain, 80% for loss, $F(1,111) = 6.06$, $p = .015$. Importantly, these results show that even 4 year olds can use expected value to avoid irrationally risky gambles.

PA - 015 Do human infants use vocal pitch cue for predicting dominance of a character over another?

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In this study, we have examined 16 human infants aged between 6.5-8.5 months to investigate whether they use the vocal pitch cue for predicting the size of a character and also whether this vocal cue affects their expectation for the dominance of characters. From a natural speech sample (“medium”) pronouncing the syllable [bi bi], we created “high” (462Hz) and “low” pitch (79 Hz) stimuli. In the animations played in the first study, Infants first heard one of the vocal stimuli and then, after screens go away, they saw one of bunny-like characters designed in three different sizes as source of the sound. We measured the looking times of infants hypothetically varying according to their expectations. After four counterbalanced test trials, in average, infants looked longer (15.30 s) at the unexpected sound-size match than the expected (13.97 s) one. According to one tail t-test, the difference was not significant neither in average nor in first pairs, but were significant based on gender(female) and age (less than 7 months). In the second study, infants were exposed to animations in which the same characters in the first study struggled to take an area from each other. Interestingly, the same subjects showed significant difference in their looking time at the unexpected versus expected scenarios(9.23s/7.20s). Therefore, although the infant’s expectation of the body size in respect with their vocal pitch might be debatable, still they use the pitch cue in their social judgment the dominance of a character over its rivals.

PA - 016 Toddlers’ eye-movements reflect (un)certainty about their knowledge of a word’s meaning

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Children quickly learn huge vocabularies, without training or feedback, and in noisy environments. To achieve this feat, there is emerging evidence that children selectively orient to new material, or engage in information seeking behaviours to guide learning. While in adults, efficient self-directed learning is predicted by accurate epistemic monitoring, it remains open to question whether children can monitor their own uncertainty about words meanings in the first place. We developed a paradigm relying on eye-movements to measure infants’ ability to monitor the reliability of their vocabulary. 18-to-24-month-old children (n=60) saw two objects on the screen, before the objects were covered by curtains. Children were then asked to look at one of the hidden objects (“Did you see the dog?”). After a delay, the correct object reappeared at its location with a rewarding animation. We manipulated whether the target word was familiar or novel. Children’s performance was indexed by their first anticipatory look during the delay period, and their confidence by their willingness to continue looking toward the side of their first gaze in the absence of external feedback (post-decision persistence). Children showed increased persistence after making a correct as compared to an incorrect gaze only when the meaning of the word was known, reflecting children’s willingness to wait for a reward depending on their first-look accuracy and their knowledge of the word. This suggests that children can appropriately evaluate their knowledge about word meanings. Future work will investigate how persistence times are influenced by graded uncertainty about word meanings.

PA - 017 Strategic reputation management: Children adjust their sharing behavior in accordance with an observer’s mental state

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[1]Nagoya University, Japan, [2]NTT Communication Science Laboratories, Japan, [3]Japan Society for the Promotion of Science, Japan, [4]Kyoto University, Japan

According to the indirect reciprocity model of cooperation, our potential actions toward a recipient may be based upon our perception of any third-party observer’s mental states about this situation, as we are motivated to obtain positive evaluations (and hence a good reputation) from such observers. Here, we investigated whether 6 to 8-year-old children (N = 75) would adjust their sharing behavior in accordance with an observer’s mental state. Children were asked to share resources with prosocial or antisocial recipients in front of an observer under two conditions that manipulated the observer’s mental state: 1) both the child and the observer possessed knowledge about the recipient’s moral character (knowledge-shared condition); or 2) the child, but not the observer, possessed this knowledge (knowledge-non-shared condition). We found that children adjusted their sharing according to what the observer knew about the recipient’s moral character. Specifically, children’s

generosity toward the prosocial recipient was not influenced by whether the observer shared any knowledge. On the other hand, children were less generous toward the antisocial recipient in the knowledge-shared condition than in the knowledge-non-shared condition. This suggests that 6 to 8-year-old children do use a flexible strategy to obtain a good evaluation. Our findings elucidate the developmental process by which humans can cooperate in indirect reciprocity; not only do they have the cognitive ability to evaluate others based on moral judgment rules, they also apply these rules to their own behavior taking into account others' mental states.

PA - 018 Perspective-taking as a developmental precursor of metacognition: A longitudinal study

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Recent metacognitive research (Kloo, Rohwer, & Perner, 2017; Rohwer, Kloo, & Perner, 2012) using a partial exposure task indicates that a firm understanding of "knowing about knowing" develops surprisingly late, at around 6 years of age. In a longitudinal study with 67 children (33 girls), this partial exposure task was used as an outcome measure at 69 months of age. In addition, first- and second-order false-belief understanding was assessed at 50, 60, and 69 months of age. At 30 months of age, perspective-taking (Flavell, Shipstead, & Croft, 1978; McGuigan & Doherty, 2002) and executive abilities (Fruit Stroop; Kochanska, Murray, & Harlan, 2000) were evaluated. A measure of verbal intelligence was given at 48 months of age. We found that metacognition at 69 months of age was correlated with first- and second-order false-belief understanding at 60 months of age as well as with perspective-taking at 30 months of age – even when verbal intelligence and executive abilities were taken into account. We argue that these results highlight the importance of perspectives for the development of an understanding of one's own mind.

PA - 019 The effects of consonant and dissonant music on prosocial behaviors of preschool children and cockatiels (Nymphicus hollandicus)

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The goal of this study was to explore the relationship between music and prosociality in a comparative approach to better understand the origins and the biological functions of our musical capabilities. In humans, it is known that music influences emotions and behavior. Indeed, studies have shown an effect of joint music production on children's empathy (Rabinowitch et al. 2012), helping behavior and cooperation (Kirschner and Tomasello, 2010). In non-human primates, studies have failed to show capacities in music perception and music production. Birds on the other hand seem to be sensitive to such stimuli as they show preferences when listening to music (Péron et al., 2008) and can follow a rhythm (Bottoni et al., 2003). However, no study to date has investigated the effect of music on prosociality in these species. We aim here at comparing children and cockatiels (a species of social bird) on musical perception and prosocial behaviors. rnIn our study, we played back to 3- to 5- year-old children and to cockatiels, either consonant or dissonant music, or recordings of their ecological environment (class background or aviary noises). Sharing, cooperative and helping behaviors were analyzed and compared between the conditions. No significant differences were found for the main outcomes neither in children or birds. However we observed significantly more social interactions between children when they were listening to consonant music compared to dissonant and neutral, and we observed a significant decrease of the cockatiels' agonistic behaviors in presence of music (consonant or dissonant) compared to background noise.

PA.e - 020 Do pragmatic language skills relate to friendly and pretend play behaviours?

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The way a child uses language in social contexts (e.g., school, playground) can have implications for their social success. Therefore, pragmatic language may be important in supporting the development of peer relationships and social competence.
We investigated how parent-reported pragmatic language skills relate to children's communications and pretend play behaviours during a play session with a classmate (N=168, Mage=5.10, SD= 0.40). Behavioural coding explored the frequency of the friendly behaviours that children displayed towards playmates (e.g., showing, sharing, paying attention, politeness). Additionally, children received a global score of their friendliness towards their peer. The videos were also coded for the frequency with which children negotiated pretence (e.g., saying 'I want to be the lion') and engaged in enacting roles (e.g., pretending to be the lion). Inter-rater reliability of the different behavioural measures ranged from Kappa= .70 to .84. Expressive and Receptive verbal abilities were formally assessed and Pragmatic language was measured using the pragmatics composite from the children's communication checklist (CCC-2).
Preliminary analyses suggest that pragmatic language, but not Expressive or Receptive language, relates positively to the frequency with which children were enacting roles during play. However, pragmatic language was not related to the frequency of verbal negotiations during pretence. In terms of friendly behaviours, pragmatic language was not linked to the frequency or global score of friendliness. Results will be discussed in terms of the possibility that pragmatic language competence supports children's pretend play.

PA - 021 Investigating the effect of contextual and personal factors on pre-schoolers' allocation behavior

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Already infants prefer equal distributions between recipients, and the "sense of fairness" demonstrated in active sharing behavior further increases during the preschool period (e.g., Fehr, Bernhard, & Rockenbach, 2008). While this effect has been found in some studies, others did not find an increase in prosocial behavior with children's age. The present study aims at investigating possible factors for these mixed results by examining two factors that might influence children's allocation behavior: the experimental setting and the allocators' attitude towards the resource to be allocated. With respect to the experimental setting, a review of the literature revealed that in virtually all studies reporting an increase in prosocial behavior the allocation process was open. That is, children made an active choice between two distributions, and the experimenter was able to observe the child's choice. With respect to the allocators' attitude towards resources, some studies report this information to be collected but do not report any analysis of this factor. Thus, so far, there is no systematic research on this factor. In this study, we measured preschoolers' attitude towards the food and non-food resources before the test. At test, children allocated resource items either egoistically (2,0) or fair (1,1) by putting them into small containers while the experimenter's back was turned. Data collection is still ongoing and will be finished in a couple of months (soon enough before the conference). However, preliminary results show that both of these factors seem to have a significant influence on 3- to 6-year-olds prosocial behavior.

PA - 022 Children's Questions in Cross-Cultural Perspective and Their Role in Cognitive Development

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Children actively explore the world and they often use language to carry out their explorations. Research has shown that young children produce explanatory-type or why-questions with great frequency, which has led researchers to suggest that these questions play an important role in cognitive development. Yet most of this research has been conducted in Western industrialized societies, and the role of children's questions in cognitive development may vary across cultures. We investigated language data of 96 3- to 5-year-old children living in four non-Western cultures (Garifuna, Belize; Logoli, Kenya; Newars, Nepal; Samoans, American Samoa; n = 24 per culture). We compared their information-seeking questions, including those seeking explanation, to Western samples (Chouinard, 2007). The number of information-seeking questions did not differ, but the proportion of explanation-seeking questions was much lower than that reported for Western children. Cultural practices help explain the results. In traditional communities, "why" questions challenge the

greater authority of adults vis-à-vis children. Also, children can see their meaningful part in relatively stable socioeconomic fabrics and may seldom need to ask for explanations. In industrial societies, children have less chance to observe adults in their occupational settings and the demands of life (e.g., new devices, techniques) may make asking explanatory-type questions an adaptive way to deal with this complexity. Our findings extend prior research in which children's question-asking varied across social context (Hart & Risley, 1992). They suggest a need for research that examines children's questions across different cultures and probes directly their role in cognitive development.

PA.e - 023 Infants' index-finger pointing frequency is related to their point-following beyond immediate visual field

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Infants' pointing production is related to their point-following skills (Leung & Rheingold, 1981; Liszkowski & Tomasello, 2011). However, less is known about infants' point following to targets falling outside of their visual field in relation to their point production. To study whether the ability to follow pointing beyond immediate visual field is distinctively related to pointing frequency at a certain time in development we measured infants' point production monthly from 8 to 14 months using the decorated room paradigm (Liszkowski et al., 2012), and measured point-following monthly from 8 to 12 months using a simple point-following paradigm (Mundy et al., 2003), where infants were to follow the experimenter's pointing towards two posters within (right and left front) and two posters outside their visual field (right and left back). Results revealed no correlations between infants' pointing frequency and point-following scores within their visual field at any age points. However, infants who correctly followed both points to their right and left back at 12 months pointed significantly more with their index fingers concurrently ($M = 20.20$, $SD = 7.95$) than the ones who correctly followed only one ($M = 3.50$, $SD = 7$) or none ($M = 7.81$, $SD = 8.34$), $F(2, 22) = 5.810$, $p < .01$. The findings suggest that, at least by the age of 12 months, infants' more fluent use of index-finger pointing might reflect a fuller grasp of the referential meaning of pointing, evinced by the following of pointing outside the immediate visual field that extends beyond an embodied turning-for-looking (Liszkowski & Tomasello, 2011).

PA - 024 The Social Motivation behind Overimitation Across Cultures

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Children from diverse cultural backgrounds tend to imitate the actions of an adult model with high fidelity. They do so even if the actions are clearly marked as arbitrary and non-functional for achieving a specific goal. Children's motivation for 'overimitation' has remained a topic of intense debate. One

account is based on children's motivation to engage with others socially, also referred to as social motivation. Accordingly, children overimitate others selectively in their presence in order to affiliate with them. In this study, we examined the role of social motivation for overimitation cross-culturally. Young children from two rural Namibian cultures (Haillom hunter-gatherers, Ovambo agro-pastoralists) and urban Germany were tested regarding their overimitative behaviors when (a) the model was present and attentive to them, or (b) the model was not present and occupied. We also tested the participants in two other paradigms that have been interpreted with regards to social motivation, aiming at examining convergent validity of social motivation in overimitation. In one task, children were given the opportunity to reengage a recalcitrant co-player in a social game. In another paradigm, we observed children's preference for collaboration over non-collaboration using a ball-sorting task. We find that children across cultures selectively imitate more actions when the model is present, highlighting the importance of social motivation for children's overimitation. However, we do not find evidence for a general link between overimitation and reengagement/collaborative preferences. Results are discussed with regards to cultural values of the tested populations.

PA - 025 Sampling the present to guide future choices in long-tailed macaques

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Nonhuman primates have to make choices concerning their conspecifics: who is a good coalition partner, who provides reliable information? There are indications that they keep track of others' past reliability in cooperating or providing information, to motivate future decisions, similar to how human children monitor informants' reliability to build up trust. However, it is not known whether such monitoring would keep count of relative rather than absolute frequencies of behaviors, and thus, be probabilistic. Here, we presented captive long-tailed macaques, Macaca fascicularis, with a task in which they could monitor numbers of rewards obtained for touching different objects in a sampling phase, in order to increase their chances of getting a reward in a test phase. In the sampling phase, monkeys were presented four or ten times with a first object, and then four or ten times with a second object. They would always obtain proportionally more rewards when touching one object rather than the other. In the test phase, both objects were presented simultaneously, and subjects had to choose between them. The frequency of being rewarded for one object in the sampling phase (condition I: 10/10 vs. 4/10; condition II: 8/10 vs. 4/10; condition III: 4/4 vs. 4/10) was predictive of the likelihood to be rewarded for choosing the same object in the test phase. Preliminary results suggest that some individuals might keep track of relative frequencies of rewards in the sampling phase, even with only few sampling trials, to choose the more reliable object in the test phase.

PA - 026 Association between infant mother sleep-wake pattern and language development

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Well-regulated sleep-wake pattern in early childhood is linked to a variety of cognitive development. Language learning outcome is also associated with sleep-wake rhythms. However, the relation of language development and parental nocturnal influence is still unclear. This study examined the association between infant mother sleep-wake patterns and language development. Nineteen infant-mother dyads participated in this study. Mean infant age was 9.5 month (SD=0.61) and mean mother age was 33.0 years (SD=3.12). The sleep-wake status was recorded for 5 consecutive nights by an activity sensor. The activity sensor was attached to infants' and their mother's waist with an adjustable rubber belt. At 21 months old, language was measured by the parental report using Japanese version MacArthur CDI (Communicative Developmental Inventory). The result of this study showed that there was a significant positive correlation between infant-mother sleep and CDI scores. Our finding suggested that infant mother sleep-wake pattern affected infants' language development.

PA.e - 027 Overhypothesis Formation in Capuchin Monkeys (Cebus apella) and Children

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The use of abstract higher level knowledge (e.g. overhypotheses) allows humans to learn quickly from sparse data, and make predictions in new situations. A study using Violation of Expectation methodology by Dewar & Xu (2010) suggests that this ability develops early in infancy, raising the possibility that it is part of our biological inheritance. To investigate the evolution of overhypothesis formation, we developed an action-based version of this task to test capuchin monkeys (Cebus apella) and 3- to 5-year-old human children. After seeing sampled evidence from three containers sorted either by type or by size, participants are presented with two new test containers and respective example items (a small, high-valued and a large, low-valued reward). Subsequently, subjects can choose between two covert samples from these containers. Depending on the observed evidence, different choices are expected to maximize the chances of receiving a large item (size condition) or a high-valued item (type condition). None of ten capuchin monkeys showed this pattern, instead choosing indifferently in each condition. Further, performance was at chance level in a follow up task with reduced cognitive demands. These results hint towards a recent evolutionary emergence of this ability. Data collection with children is ongoing but preliminary results suggest better performance when compared to monkeys. Results of the capuchin monkeys and the children will be compared to a probabilistic hierarchical Bayesian model (Kemp, Perfors, & Tenenbaum, 2007) to examine in more detail how the species differ in forming general principles after observing a small amount of data.

PA.e - 028 Two-year-old children show flexibility in immediate re-enactment but not in memory retrieval in a delayed imitation paradigm

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The study investigated 2-year-old children's memory. To explore whether children remember general, goal directed parts of an event or episodic aspects as well, we created a delayed imitation paradigm involving two occasions 1 week apart. Between occasions the situational constraints changed, which demanded either to retrieve a previously irrelevant unique step (use of a tool) in order to achieve a goal; or the omission of a previously relevant step. Participants (n = 36) were presented with objects, and a model demonstrated how to achieve them. The model always used a tool to achieve objects regardless of its necessity (object close/far). Demonstration was followed by immediate reenactment under the same constraints, and one week later the constraints changed and children were allowed to obtain the goal with no additional demonstration. In close first condition children were more likely to use their hands, however in far first condition children were more likely to use the tool. After constraint changing children in close first condition continued to use their hands. Children in far first condition used the tool less than before. Without demonstration of the tool children almost never used it spontaneously, so tool usage during experimental conditions is more likely a learnt behavior than an online solution to the task. Based on these results we propose that early memory shows mainly characteristics of general, semantic memory and episodic irrelevant information gets omitted with time.

PA - 029 Social and psychological contexts for tool-innovation

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Young children's difficulty innovating tools has been reported by several research groups, yet the context for this has yet to be fully investigated. We explored whether children's behaviour and innovation success were affected by the context in which the problem was presented. We used a hook-making task, in which a pipecleaner should be bent into a hook to retrieve a bucket from a tube, that has proved difficult for under 8s.
In Study 1, we speculated that children may make a pedagogical assumption that the adult present would guide them. We tested 4-5 and 6-7 year olds either in the presence of an adult, or left alone. Younger children's success was not affected by the absence of the adult (p=.281), although they tried a larger number of strategies to retrieve the bucket. Older children were more likely to succeed when left alone (p=.040), but there was no impact on the strategies used.
In Study 2, we drew on evidence that psychological distance can prime creativity (Liberman et al., 2012). 6-7 year olds were primed with a picture set progressing from near items (e.g. pencil on desk) to far items (e.g. solar system), far items to near, or the pictures in a random order. Innovation was most likely in the near-to-far condition (p=.017), but the far-to-near condition also resulted in better performance than random (p=.046).
In two studies, we found that 6-7 year olds' innovation could be improved by changes in context. We will discuss possible mechanisms for these effects.

PA - 030 Evolutionary roots of social comparison processes: effects of task relevance and competition on task performance in long-tailed macaques

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Social comparisons are a fundamental feature of human thinking and affect self-evaluations and task performance. Children are interested in comparing themselves to others from young age, but only little is known about the evolutionary foundations of social comparison processes. Previous studies that investigated social comparisons in nonhuman primates by exploring the influence of partner performance on subject performance yielded mixed results regarding the presence of human-like social comparison processes in nonhuman primates. In the current study, we focused on the effect of task relevance, as more salient settings may promote social comparison processes. We conducted three experiments in which we explored the effects of task type (ecologically irrelevant touchscreen task vs. relevant feeding task) and co-action type (competitive vs. co-active) on performance in long-tailed macaques (Macaca fascicularis). In a touchscreen task, subjects (N=8) were neither influenced by nor interested in the performance of the partner. In contrast, in a novel feeding task, monkeys significantly increased their feeding speed in competitive conditions (N=8), as well as in the absence of direct food competition, when a human co-actor foraged on a separate food source (N=11). Performance levels are thus adjusted not only in direct, but also in anticipated competition. We suggest that this effect constitutes the foundation for the more elaborate social comparison processes found in humans, which may involve context-dependent information processing and metacognitive monitoring.

PA - 031 Preschoolers retrospectively reevaluate word meanings provided by an unreliable informant

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Preschoolers track informants' reliability, preferring to learn new information from previously reliable informants (Koenig & Harris, 2005). In the majority of studies on children's selective learning, reliability demonstrations precede the presentation of novel information. However, in many social learning contexts children do not know informants' reliability status beforehand. Some research indicates that preschoolers are able to re-evaluate beliefs about causal properties retrospectively

(e.g., Sobel, Tenenbaum & Gopnik, 2004). Can children retrospectively re-evaluate verbal information after discovering that the informant was unreliable?
Using a between-subject design, we tested 48 4-6-year-olds (Mage=5.00) who watched an experimenter label two novel objects. The experimenter subsequently revealed that she was either accurate or inaccurate in naming familiar objects. Children's knowledge of novel labels was tested in a forced-choice procedure.
Children chose correct objects corresponding to the tested labels significantly more often when the informant was revealed to be reliable (78%) than when she was unreliable (55%), Wald=7.45, p=.006. By preschool, children can retrospectively re-evaluate verbal information based on new knowledge about the reliability of the information source. Such an ability has important implications for the correct transmission of information in social learning situations. A follow-up experiment that investigates the mechanisms underlying children's re-evaluations is currently underway.

PA - 032 Nuances of "we": the effect of utterance contexts on the distribution task performances in children with/without ASD

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Psychological bonding or unity between self and the other, "we" ness, is important basis that enables human cooperation. Virtually all human languages have a word representing "we", which in the sense of "first person plural" sounds in a way illogical. The development of the concept of "we" remains unclear. Moreover, the nuance of "we" flexibly changes depending on the context it is used. The authors examined the sensitivity to the nuances of "we" in an experimental setting. Children with/without ASD (N = 40 / 49) participated in the study. Each participant was tested with 9 stories presented in slide show. Each story has 2 phases followed by the distribution task: (1) Context: 2 children (Reporter and Partner) work on a task together; either (1-a) Reporter, (1-b) Partner, or (1-c) Both Reporter and Partner succeed(s) in it. (2) Report: the both children come back to an adult; Reporter says either (2-a) "I did it!", (2-b) "He/She did it!", or (2-c) "We did it!" (3) Distribution: The participant was then requested to distribute 5 pieces of resource between Reporter and Partner. The results showed only TDs distributed significantly more in response to the "altruistic we" utterance (1-a X 2-c) and less to the "free-riding we" utterance (1-b X 2-c). The results in ASDs might reflect weaker sensitivity to the "we" nuances, or weaker tendency to link the distribution task to the previous contexts, whereas TDs' responses suggested both robust sensitivity to the nuances and tendency of linking social contexts to social evaluation.

PA - 033 Finding an emotional face in the kindergarten

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A large body of researcher showed that threatening stimuli, e.g. angry faces evoke the fastest response in a visual search task. They argue based on mostly evolutionary theories that it is inevitable to notice threatening stimuli and to respond them automatically. However, others argue that the distinctive emotion on faces is the happy expression, and proved that people tend to reaction faster to happy faces than angry ones. We think that testing preschool children may be the key to answering whether angry or happy faces have the advantage in visual processing. Thus, our respondents were children between the age of 3 and 7 (M=5.23, SD=0.79). We used the classical odd-one-out visual searching task. Children had to find an emotional face in a neutral crowd. The emotions used were happiness, fear, and anger. In order to increase the reliability of our results a touch screen monitor was used to collect reaction times. Our results showed that children find the happy faces the fastest, then angry faces somewhat slower, and reaction time for the fearful faces was the slowest.
In sum, our results are in line with previous research emphasizing the universal nature and distinctive features of happy facial expressions, e.g. smiling compared to mouth posture in negative emotions.

PA - 034 Infants' understanding and using of emotional information from others

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When infants do not have any knowledge about novel and unfamiliar targets, they tend to explore the information from their surroundings. Numerous previous social referencing studies suggest that infants often get emotional information from others to regulate their own behaviors toward both physical and social targets. Social referencing is constituted by two aspects: "information gathering" and "regulation": the former deals with the question of "why infants look", and usually has been measured by looking behaviors. On the other hand, the latter focuses on changes in infants' behaviors after they receive emotional messages regarding stimuli (Walden, 1991). In this study, we investigated infants' social referencing by looking into their gaze behaviors and behavioral changes separately, therefore examined infants' understanding and using of emotional information about social targets and asocial targets using social referencing paradigm.
Twenty-eight 12-month-old Japanese infants (M=368.75days, SD=8.75days) participated in either Social Target condition or Asocial Target condition. We tested infants' gaze behaviors during the observation of stimuli, after then, let them to choose either positively evaluated target or negatively evaluated target by reaching. The results show that there seems to be some difference between social and asocial targets in information processing. These results suggest that infants might understand and use the others' emotional information.

PA - 035 Use of communicative gestures in completely nonverbal children with autism

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Language does not develop in either production or comprehension in at least 25% of individuals on the autism spectrum, who form its most severe and understudied end. We aimed to shed light on language-gesture relationships by profiling production rates and types of nonverbal communicative gestures in this population. Standardized measures of nonverbal IQ (as measured by Leiter-R) and nonverbal symbolic cognition (as measured by ComFor) were also taken. Language status as a recruitment criterion was confirmed in both production and comprehension through diagnostic interviews (ADOS and ADIR), teacher informants, and standardized language tests. There was no evidence of apraxia in this sample. Results showed the complete absence of declarative gestures including distal pointing, and even distal imperative pointing was scarce at the group level, as were iconic gestures. Overall gesture production rate was low as well, although in a study run in parallel, mean-rank distributions of gesture rates in typically developing pre-verbal infants between 9 and 22 months were interestingly not significantly different. The proportion of bimodal communicative acts (gesture + vocalization) was significantly lower than gesture-only acts. 79 % of individuals scored ≤70 in nonverbal IQ. Neither language nor gesture scores correlated with levels of nonverbal symbolic cognition, which in turn were significantly correlated with nonverbal IQ.

PA.e - 036 Does exploratory behavior encourage successful and creative tool innovation?

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Prior work has shown that children have difficulty manufacturing a novel tool for a novel problem. These studies only gave children 1 or 2 choices of material for tool innovation. In this paper, we explore whether providing children with a variety of materials encourages novel tool creation as well as success on a problem-solving task. Four- to 7-year-old children (N = 54) were given 10 minutes to solve a task that required creating a tool to retrieve prizes at the bottom of a container.
We coded the quality and quantity of tools made. For example, we coded how many materials the children used, the number and complexity of (# of materials used in) the tools, and the number of all unsuccessful attempts and successes achieved with the created tools. Older children (n = 14) were more likely to create successful tools (p = .024) than younger children. Although 38 children were not successful, they were creative and exploratory. These children created an average of 2.49 unique tools (range 1 – 11 tools) with different sets of materials. Thus, it seems that older children in this task were better at creating successful tools. However, unsuccessful children did not perseverate on one solution; instead they created a range of tools using a variety of materials. We discuss developmental results as well as the limitations and benefits of exploratory behavior on creative problem-solving.

PA.e - 037 Young infants' teleological representations of cooperative vs. competitive goal-pursuit

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Human infants are sensitive to goal-directed actions efficiency (Gergely et al., 1995; Skerry, Carey, & Spelke, 2013), as well as others' intentions and beliefs (Onishi & Baillargeon, 2005; Kovacs et al., 2010), but it is unknown whether this early preparedness for the representation of the others intention, goal directed action and efficiency also involves the ability to represent interactive goal-directed events within a teleological framework such as when more than one agent pursue the same goal.
In order to explore this question we presented two groups of 13-months old infants with video animations depicting one of two possible scenarios of chasing events that included two balls chasing a third smaller ball.
During familiarisation each infant was presented with one of two sets of behavioral cues. For one group these cues reflected cooperative (action coordination and joint efficiency between chaser agents) for the other group competitive (attempts to hinder the competitor) pattern. During the test phase each group saw the two agents reach their goal (caught the chasee) in either of two possible alternative ways: the scenes ended with either equal of unequal distribution of the achieved result (sharing or not sharing the prey).
We found that after seeing the cooperating agents infants expected them to distribute the gained goods equally (sharing): infants looked significantly longer in the non-sharing condition. On the opposite, when agents demonstrated cues of competitive chasing behavior, infants did not expect the agents to share the "prey", which is indicated by their significantly longer looking times when observing the sharing outcome.
These results suggest that the infants are able to recognize cooperative vs. competitive patterns of goal-pursuit performed by multiple agents and to use this categorization of the events to make differential inferences about equal or unequal distribution of the benefits achieved.

PA - 038 Conformity in Children in a Culturally Diverse Country

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Humans depend on their fellow human beings and conform to them for normative and informational reasons. Recently it was shown, that also children conform to peer groups, even when they themselves know better. However, these results are mostly constrained to western populations.
The current study investigated conformity in 8 different populations in Vanuatu, a country with a rich

cultural and linguistic diversity. We tested 163 groups of 4 children between 4 and 10 years of age by using a child-friendly version of the Asch paradigm (similar to Haun & Tomasello, 2011).
By the end of the year we expect results answering the following questions: Do children in Vanuatu conform to a majority of peers? Do they behave differently depending on whether they give their answer anonymously or in public? How does conformity develop throughout childhood? Are there gender differences?
Furthermore, the intracultural comparison allows to investigate the relationship of conformity and diversity within a village (measured by number of spoken languages and number of religions) as well as the relationship of conformity and diversity between villages (measured by number of surrounding languages). Therefore, results will be also discussed in respect of conformity's role in shaping societies.

PA - 039 Towards a unified understanding of self-regulation: Interrelations between Executive Function, Metacognition, and Effortful Control in preschool children

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Executive Function (EF), Metacognition (MC) and Effortful Control (EC) are three constructs that have been related to children's ability to regulate behavior, emotion, and cognition. However, stemming from different research traditions, they have been investigated largely in isolation, despite theoretical and conceptual overlaps (e.g., Roebers, 2017; Zhou, Chen, & Main, 2012). Recently, there has been an increasing pledge for an integration of research on different aspects of self-regulation (Nigg, 2017) for a better and more unified understanding of these abilities. Therefore, the aim of the current study was to examine the interrelations between multiple measures of EF, MC, and EC. The study sample included 100 children at the age of 4-6 years who attended kindergarten. EF was assessed using a computerized version of the Fruit Stroop (inhibition), the dimensional card sorting task (shifting), and the backwards color span (working memory). MC was measured in a paired-associate learning task. EC was assessed with the Eisenberg's Puzzle Box, Kochanska's Whisper Task, and the Children's Behavior Questionnaire (CBQ). Preliminary analyses showed that different measures of EC were significantly related to working memory and shifting, but not inhibition. Whereas metacognitive control was positively correlated with EC assessed through the puzzle task, metacognitive monitoring was associated with the EF measure of inhibition. Surprisingly, no significant correlations were found between EF measures and metacognitive control. Our findings suggest an overlap between only some of the core components of the three constructs EF, MC, and EC.

PA - 040 Redefining Minimal Mindreading

Brandon Tinklenberg
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Primates and infants may be responsive to others' perceptual perspectives, though their capacity is generally distinguished from children's ability to verbally reason about others' beliefs. That said, testing belief representation by measuring preferential looking times has some now thinking both preverbal infants and nonhuman primates have mindreading skills as well. Determining exactly what individuals are tracking in these cases, I argue, starts by disentangling automatic belief representation and perceptual mindreading. One way to explain this difference is to consider mindreading as decomposable into unique social cognition skills. According to the two systems account, infants and primates succeed in perceptual mindreading tasks since those tasks require representing subdoxastic states and yet systematically fail at explicit belief representation. This interpretation, in relation to early mindreading studies, poses a dilemma for two systems accounts. If the abilities underwriting performance in both tasks are functionally identical, then early mindreading tasks measure nothing more than a species of perceptual mindreading. There is therefore no basis for thinking that preferential looking experiments demonstrate that individuals are sensitive to the beliefs of others. If they are functionally distinct, then subdoxastic states ascribed in perceptual mindreading situations and those ascribed in early mindreading tasks are related in a way that demonstrates two systems accounts are at best underspecified. I provide a qualified defense of the two systems view by suggesting a principled way to 'reify' subdoxastic mentalistic representations. This defense offers explicit heuristics for mechanism discovery which would provide a 'unique causal role' for species of subdoxastic states.

PA - 041 A parental questionnaire for infants' early communication abilities at the age of 8-10 months – the German "Baby-Komm"

Silke Fischer[1], Iris Nomikou[2], Angela Grimminger[1], Katharina Rohlfing[1]
[1]Paderborn University, Germany, [2]University of Portsmouth, UK

From very early on, infants participate in communicative interaction and can understand some highly frequent words at the age of 6 months. However, it is not until 12 months that nonverbal communicative behavior, such as a pointing gesture, can be identified. In parental surveys assessing children's early language development (e.g. MCDI), only few of these later conventionalized nonverbal behaviors are considered.
Thus, we present a novel parental questionnaire the purpose of which is to assess infants' early ways of communicating at the age of 8–10 months. Central to this instrument is a differentiation between initiative and responsive ways of communication. This distinction seems to be relevant for language development, as in terms of joint attention – one important precursor of language development – individual differences in initiating the joint attention episodes or responding to joint attention can

predict differences in later language (at 24 months; Mundy et al., 2007).
The two scales of the questionnaire (responsive vs. initiative) further subdivide the infants' communication acts according to the extent of their conventionalized content (conventionalized vs. non-conventionalized), as infants gradually learn to do things in the way they are done in their culture (Tomasello et al.; 2005).
An infant's behavior is captured in everyday situations (e.g. a good-bye situation), with emphasis in assessing her emerging collaborative activity (Nomikou et al., 2016), amongst others.
This is to our knowledge the first parental questionnaire to assess the scope of infants' communication shortly before the acquisition of vocabulary at this very young age of 8-10 months.

PA - 042 Studying Subjective Experiences in Infants: A Case Study from the Developing Sense of Agency

Lorijn Zaadnoordijk, Sabine Hunnius
Radboud University, Netherlands

The sense of agency, the feeling that one's actions cause effects, plays an important role in socio-cognitive development. However, as infants cannot verbally report on their experience of agency, the research into the developing sense of agency is confronted with a complicated question: how can we know what infants experience from their first-person perspective? We take an innovative approach in which we combine theory, simulation work and neuroimaging to study infants' sense of agency. We propose a theoretical framework in which ideas from mechanistic explanation in cognitive science and cognitive phenomenology are combined to guide the research into infants' subjective experiences. We applied this framework to two lines of research into the developing sense of agency. In the first research line we simulated the performance of a 'babybot' imbued with a learning mechanism designed such that it is incapable of learning causal relations between its actions and their effects. We showed to what extent behavioral patterns were sufficiently explanatory to infer a sense of agency in young infants. Following up on the simulation results, our second research line was an EEG experiment in which we searched for further evidence that infants build causal action-effect models. In our presentation, we will elaborate on the results of these studies. Moreover, we will explain how these lines of research (theory, simulation and experiment) provide complementary answers to questions about infants' sense of agency, and, more generally, how researchers could investigate subjective experiences of infants and other non-verbal participants.

PA - 043 Does inhibitory control and group membership influence young children's preferences for the distribution of resources?

Reka Kassai, Zsofia K. Takacs, Judit Futo
Eötvös Loránd University, Hungary

Experimental evidence shows that young children in general avoid being at a relative disadvantage compared to others when it comes to the distribution of resources. Sheskin and colleagues (2013) found that children between the ages of 5 and 6 are even willing to take a cost (reduced absolute gain) in order to have a relative advantage as opposed to an equal or a negative distribution. This was proved by using a task where children had to distribute tokens between themselves (the participant) and a fictive partner.
The present study is aimed to broaden the scope of our knowledge by investigating the effects of 1) the type of reward (chocolate as an immediate reward or tokens that can later be exchanged to stickers as a delayed reward) and 2) the group affiliation (ingroup vs outgroup) of the fictive partner. We hypothesized that getting an immediate reward would diminish the importance of the relative advantage or disadvantage as compared to the significance of the amount of absolute gain of the participant. The group membership of the fictive partner was expected to have an effect on the preferred pattern of distribution of the rewards, namely that outgroup membership would bias choices towards a stronger relative disadvantage of the other (partner).
Additionally, the potential moderating role of inhibitory control skills was assessed.

PA - 044 The effects of mindfulness meditation on children's executive functioning: A meta-analysis

Boglarka Vekety, Reka Kassai, Alexander N. H. Logemann, Zsofia K. Takacs
Eötvös Loránd University, Hungary

Relatively recently, several studies have shown support for a facilitating effect of mindfulness meditation on executive functions (EFs) in children. The aim of the present meta-analysis was to synthesize the results of previous studies on mindfulness in relation to EFs in typically developing preschool- and elementary school-aged children. Studies that have compared the effects of mindfulness meditation to a control group in a (quasi-) experimental study design on EFs in children (up to 12 years of age) were included in this quantitative synthesis. Based on six studies that included in total 214 children, results showed that mindfulness meditation positively affected neuropsychological tests of EFs ($g+ = 0.47$, $k = 6$, $p < 0.001$). Considering the subcomponents of EFs, mindfulness improved inhibition ($g+ = 0.34$, $k = 5$, $p < 0.02$), but did not render significant effects on cognitive flexibility skills ($g+ = 0.18$, $k = 4$, $p = 0.46$). Mindfulness seemed to improve working memory, but this was only assessed by one isolated study ($g+ = 1.06$, $k = 1$, $p < 0.004$).
In conclusion, results indicate that mindfulness meditation has potential to foster children's EF skills. Possible top-down and bottom-up mechanisms for this beneficial effect will be discussed such as

practicing conscious monitoring and regulation of attention in addition to lowering stress and anxiety (Zelazo & Lyons, 2012). However, it has to be noted that only a limited number of methodologically rigorous studies using an experimental design and neuropsychological tests of EFs were available.

PA - 045 Infant vocal imitation of infant-directed singing

Lucia Benetti, Eugenia Costa-Giomi
Ohio State University, USA

Infant-directed (ID) singing has important caregiving functions (Trainor, 1996). Less is known about the role of ID singing for music and language learning and whether infants' vocal production incorporates features of the music they hear.
This study investigated infant learning from ID singing by focusing on infant vocal imitation of music. Instances of music imitation in two daylong recordings of one infant were identified. Here, one imitative interaction between infant and father was selected for detailed discussion of perceptual and acoustic analyses. The sequence of events is as follows: (1) The infant called his father and vocalized a syllable sequence with melodic and rhythmic structure and regular beat. (2) The father identified the sequence as the playsong "Rain Rain" and proceeded to sing the song. (3) The infant vocalized in response to the father within periodic pulse of the music, imitating the phonetic content of the father's lyrics while maintaining the music structure constant. (4) The father continued singing, and the infant imitated two more times.
The infant's imitation of both music and speech components suggests that singing was a source of language and music information. The father's elaboration of the infant's initial vocalization and the subsequent imitative turn-taking suggest that singing provided a shared framework for contingent feedback, vocal coordination, and joint attention. Furthermore, the infant's unprompted initiation of the music interaction suggests that he was motivated to engage in a shared music experience. These results suggest that singing to infants may be beneficial for music and language learning.

PA - 046 Words, hands or looks? Understanding teaching strategies in children with cochlear implants

Luciana Lucchina[1,2], Nicole Pochinki[2,4], Ariel Haimovici[1,2], Percival Denham[3], Mariano Sigman[1,2], Cecilia Inés Calero[1,2]
[1]CONICET, Argentina, [2]Universidad Torcuato Di Tella, Argentina, [3]Instituto Oral Modelo, Argentina, [4]Northeastern University, USA

Some aspects of human communication rely on an implicit communication protocol. Previous studies (Csibra & Gergely, 2009) demonstrated that learning in children changes when demonstrations are accompanied by ostensive behavior. Ostensive cues (OC), which are signaled by a broad set of non-verbal behavior, act as prosodic markers providing emphasis to relevant items of the discourse. At the lab, Calero et al observed that preschool children can not only detect, recognize and react

to OC, but furthermore, they are capable of generating them when teaching. Also, there are other non-verbal behaviors that are not ostensive but nonetheless have clear pedagogical importance. The clearest examples are gestures. Children spontaneously produce gestures early in life and it has been shown that encouraging them to use gestures brings out implicit knowledge and leads to learning. However, we wonder whether non-verbal language will have the same impact on all populations. Previous studies have shown that deaf children use their gaze more and develop more gestures as iconic symbols to communicate, even without being exposed to sign language. With that in mind, we performed a study in collaboration with Oral Model Institution, a school of children with cochlear implants. We are trying to understand if they are able to receive and emit the same OC in pedagogical events described in children with expected development, or, as an alternative, they develop other strategies with the same goal.

PA.e - 047 Do children imitate robots?

Hanna Schleihauf[1,2], Neli Tsvetkova[1], Alexander König[1], Katja Mombauer[1], Stefanie Hoehl[2,3], Sabina Pauen[1]
[1]Heidelberg University, Germany, [2]Max Planck Institute for Brain and Neuroscience, Germany, [3]University of Vienna, Austria

Imitation plays a significant role in cultural knowledge transmission and in learning. The tendency to imitate causally irrelevant actions is termed overimitation. Since it is considered a social phenomenon unique to humans, we tested if it is necessary that also the model is human. Therefore, we tested whether 5 to 6-year-old children would also overimitate a humanoid robot. Fifty-six preschoolers were randomly assigned to watch either a robot or a human retrieve a reward out of a puzzle box, using functional and nonfunctional actions. First, children observed, how the reward was retrieved using an inefficient strategy with nonfunctional actions, afterwards it was the child's turn. Second, they observed how the reward was retrieved efficiently without nonfunctional actions, afterwards it was the child's turn again. Third, they observed again the inefficient strategy and afterwards it was their last turn. We found, that children copy whichever strategy was shown — an inefficient or efficient one, regardless who the model was and whether they had already performed the other strategy first. They were even likely to perform the inefficient strategy after having used the efficient one. That meant that children were as likely to imitate a robot as a human and switched flexibly between an inefficient and an efficient strategy. Those results are discussed in context of understanding the phenomenon overimitation.

PA - 048 Children's long-term learning from linguistic in-group and out-group members

Eszter Endrődi[1], Katalin Oláh[1], Ildikó Király[1,2]
[1]Eötvös Loránd University, Hungary, [2]Central European University, Hungary

Numerous studies have shown that even few-month-old infants can differentiate between certain social groups, and that children prefer to accept information from people belonging to their linguistic group from early on. The aim of our study was to test whether children prefer to store information in long-term memory coming from a linguistic in-group member over someone speaking in a foreign language. To investigate this question, we designed a paradigm where a model speaking either in their native or a foreign language presented 4-, and 5.5-year-old children an action (how to retrieve a toy from an opaque box) and children had the opportunity to manipulate the box themselves immediately after the demonstration and a week later. Preliminary results show no difference between the two groups in the direct imitation task, however, we found that the native group performed better than the foreign group in delayed imitation. The results we have gained so far imply that children's long-term retention of information is affected by the group membership of the source, independently of their immediate performance on the task.

PA - 049 The comprehension of existential negation and denial in 18 and 15-month-olds

Eszter Szabó, Ágnes Melinda Kovács
Central European University, Hungary

Negation is a fundamental cognitive device supporting logical reasoning and it is also an omnipresent linguistic tool. Studies targeting the developmental trajectory of children's production of negation show that negation appears early (around 12-18 months), first in expressing non-existence ("All gone") and rejection ("No"), and only about a year later denial ("The ball is not in the box"). It is not clear whether at the first stages of negation production infants' conceptual abilities are masked by their difficulties in comprehending and producing more complex syntactic structures or there is a conceptual change through the development. In the present studies we investigated infants' comprehension of existential negation and denial. We used a two-alternative choice task in which infants had to find a hidden object based on the verbal information about where the object was not. In Study 1, we tested 18-month-olds' understanding of existential negation, and in another group, their understanding of denial. In Study 2, we investigated 15-month-olds' comprehension of the same two forms of negation and the relation between the two.
18-month-olds (N=52) succeeded in both existential negation and denial. Based on preliminary analyses, 15-month-olds (N=18) fail in both conditions and their behavior reflects a different developmental trajectory for the two forms of negation. While they perform at chance with existential negation, they perform below chance with denial, indicating that they ignore the negative particle. There was no correlation between performance with the two forms negation, which, with a bigger sample, might point towards a conceptual change hypothesis.

PA - 050 Neural markers of adaptation in children at high- and low- risk for autism spectrum disorders (ASD)

Emma Ward[1], Jan K Buitelaar[1,2], Ricarda Braukmann[1,2], Sabine Hunnius[1]
[1]Radboud University, Netherlands, [2]Radboud University Medical Centre, Netherlands

This experiment is part of a longitudinal prospective study of young children at increased familial risk of autism spectrum disorders (ASD). Around 20% of these children will receive an ASD diagnosis themselves compared to 1% of the general population.
The Predictive Processing account of ASD posits that people with ASD rely less on expectations than people without ASD when it comes to interpreting new sensory information. The current study investigates whether this reduced effect of expectations is already present in high-risk 2-year-olds, before ASD can reliably be diagnosed, using an adaptation paradigm with EEG.
Participants saw the stimuli and procedure from Pellicano, Rhodes & Calder (2013). Participants were first familiarised with the stimuli, which consist of models looking in various directions (cf. Jenkins, Beaver & Calder, 2006; Pellicano et al., 2013). Participants were then adapted to one extreme gaze direction in block 2, which biases perception of later stimuli. In block 3, participants were shown test stimuli with various gaze directions and their EEG responses were recorded to examine the influence of the adaptors on subsequent perception.
High-risk children are expected to differentiate less between the adapted and the unadapted direction in block 3 (smaller ERP-amplitude differences) than typical children. This would indicate that the high-risk group adjusted their expectations less based on the adaptation block, and that their perception was less biased by the adaptors.
We are currently analysing the EEG data and the results will be presented at the conference.

PA - 051 The influence of mutual manifestness of partner's costs on prosocial choices in 6- to 8-year-old children

Francesca Bonalumi, Gergely Csibra, Christophe Heintz
Central European University, Hungary

Previous literature suggests that children do engage in costly activities to honour previous joint commitments with their partners (Gräfenhain, et al., 2009; Hamann, et al., 2012). Although in these experiments the expectations of their partners have never been explicitly recognized, this factor has been always implicitly manipulated. We suggest that having those expectations manifest between the two agents is the key factor in producing a feeling of commitment and motivating prosocial choices. With our experiment we address directly this issue, manipulating the access of information as a means

to vary the manifestness of the agents' expectations. Using a child-friendly tablet game, we implement a two-person response game in which 6- to 8-year-old children collect rewards while playing with another player. The game puts player A in the position of choosing whether to play alone or with player B. The rewards are distributed in such a way that the interests of the two players are not perfectly aligned: whereas, for player B the interaction is always preferable, player A's preference for interacting depends on B's future choice. We manipulate the players' knowledge of the opportunity cost paid by A, which serves as cue of her expectations about B's behaviour, and we measure both players' choices. We predict that having this information manifest will positively influence both A's choices of entering the interaction, i.e. betting on B's reciprocity, and B's reciprocal choices.

PA - 052 Neural substrates of false belief processing at the transitional stage (3-5-year olds): fNIRS study

Maciej Haman, Agnieszka Pluta, Joanna Wysocka
University of Warsaw, Poland

Several neuroimaging studies were devoted to "the social brain" in general, and brain's activity during solving the false belief task in particular, however most of them was done with adults, or at least school-age children. Only a few studies involved younger participants including connectivity study at rest or event-related oscillations EEG study. The results as far suggest that the same general social cognition network, with a sub-network dedicated to belief processing, are functional in all age groups, although the level of integrity and specificity of these networks significantly increases with age. None of these studies, however, did test brain activity pattern during false-belief, true-belief and no-belief events processing in 3-to-5-year-olds, i.e. at the expected transitional age in "Theory-of-mind" development. Our research project is intended to fill this gap. Here we report the results of the pilot study. A group of 3-5-year olds (N=11 at this moment, the study is in progress) was tested in three conditions (false-belief, true-belief, no-belief animations, balanced for other factors) with 32-optode f NIRS system placed over bilateral temporoparietal and prefrontal sites. As far significantly increased activity was found in left temporoparietal region for false-belief compared to no-belief condition. EF and linguistic test were additionally administered to participants. Additional behavioural study using the same methods with other group of preschoolers and fMRI study with adults was also run to validate the methods, and confirmed methods' reliability.

PA - 053 Modal Markers and Shared Thinking in Early Education

Frauke Hildebrandt[1], Karoline Lohse[1], Andrea Hildebrandt[2]
[1]Potsdam University of Applied Sciences, Germany, [2]Ernst-Moritz-Arndt-Universität Greifswald, Germany

Human thought can be characterized as being situated in the "space of reasons" (e.g., Brandom 1994; McDowell 1994; Sellars 1956). Motivated by empirical findings on the efficacy of "Shared Thinking" in educational settings (e.g., Bonawitz et al. 2011; Hamre et al., 2013; Hildebrandt et al., 2016; König, 2009; Siraj-Blatchford, 2002; Sylva et al., 2004) we claim that there is a specific class of speech acts that adults can employ to support children's entrance into the "space of reasons". Epistemic attitudes are attributed by using specific modal markers (e.g. maybe, certainly, sure). These semantic elements signal second-order-beliefs (beliefs about beliefs). In particular, they represent the difference between belief and justification, and thus signal the need for justification of a belief.
The first aim of our experimental study was to investigate direct effects of modal markers on children's verbal behavior within adult-child interactions. The second aim was to explore whether the use of modal markers improves children's performance in recalling the content of dialogues that they previously acted in with the adult. The collected data (N = 56) revealed that the use of modal markers has an influence on children's verbal behavior: In the first situation, children speak more in the modal-marker condition and they generate more own hypotheses compared to the non-marked condition. In the second situation, they report their own hypotheses as well as those given by the experimenter. Linear mixed effects modeling shows that these effects are moderated by children's Theory-of-mind-abilities.

PA.e - 054 Scaffolding Young Children's Experimentation on the Balance-Scale

Johanna van Schaik, Maartje Raijmakers
Leiden University, Netherlands

Young children use "naïve" science concepts to make predictions about the world. For example, kindergartners tend to consider only the number of weights on either arm of a balance-scale when predicting which side will go down, ignoring the distance of the weights from the fulcrum. When confronted with evidence in contrast to their prior beliefs, children have been shown to specifically sample new evidence by performing informative experiments (van Schijndel et al., 2015). Yet, while such sampling should help children update their science concept, this experimentation can be ineffective when a less-salient dimension needs to be discovered (e.g. distance). The current study investigates whether limiting children's experimentation can guide children towards the less-salient dimension. Five- to seven-year-olds are shown a surprising event on a balance-scale and can subsequently perform experiments themselves. Half of the children (i.e. scaffolding condition) are forced to experiment with distance as they are not allowed to use hooks at equal distances from

the fulcrum to hang their weights. Pre- and post-tests as well as a transfer task measure children's concepts of balance and the types of experiments they perform are coded. While testing is currently underway, pilot results reflect the hypothesized patterns: descriptively, children in the scaffolding condition tended to perform more unconfounded distance experiments and have higher post-test scores on distance items than those in the no-scaffolding condition. Final results will be available at the conference. This investigation will contribute to theories of conceptual change and simultaneously provide a directly applicable science education method.

PA - 055 Effects of a short mindfulness based intervention on preschoolers' executive functions

Adam Koncz, Zsolt Demetrovics, Zsofia K. Takacs
Eötvös Loránd University, Hungary

Mindfulness meditation has been found to improve children's executive functions (Flook, 2010), and may be effective to reduce stress. Executive functions (working memory, shifting, cognitive flexibility) have an essential role in school readiness. These skills are more important predictors of reading and mathematics skills than IQ (Blair and Razza, 2007). Starting? school can be stressful for children that might lead to debilising anxiety (Talbot, 2016).
In a randomized controlled trial we assessed whether a short mindfulness-based meditation training in August before entering school can improve 6-7 years old preschoolers' executive functions. One explanation might be that mindfulness meditation decreases their cortisol levels which is turns contributes to their cognitive functioning. In order to test this hypothesis, we collected saliva samples to evaluate cortisol levels on the weeks before and after the intervention, and after school entry. Results of the experiment will be presented on the conference.

PA - 056 Moral judgments stick within the family

Niklas Dworazik[1], Joscha Kärtner[1], Leon Lange[2], Moritz Köster[1,3]
[1]University of Münster, Germany, [2]University of Wuppertal, Germany, [3]Freie Universität Berlin, Germany

There is a lively debate in moral psychology about the developmental origins of human moral inclinations. However, a crucial context of social learning has been out of the research focus so far: moral learning within the family. In this study, the moral preferences of 56 3- to 6-year-old children and their mothers were tested in a set of classical Trolley scenarios. Children judged moral dilemmas like their mothers, indicated by very consistent correlations between their responses and overall highly similar response pattern ($p = .00000003$). In addition, children's response tendencies in moral dilemmas were similar to those generally found in adults, indicating that their judgements may be guided by similar moral principles. These results have striking implications for moral education, indicating that favorable or unfavorable moral principles are socialized within the family and the societal context from early childhood on.

PA - 057 The Use of Episodic and Semantic Memory Systems in Classroom Context

Nur Elibol-Pekaslan, Basak Sahin-Acar
Middle East Technical University, Turkey

This study aimed to examine the use of episodic and semantic memory in classroom context among college students. Specifically, the first aim was to examine the role of short and long time delays on the frequency of using episodic and semantic memory systems. The second aim was investigate the role of college experience level on the use of memory systems and the transition from one to another. In order to test the hypotheses, data were collected from freshmen and senior students in two phases with two time points. In the first phase in 2014, 52 freshmen and 52 senior students were given exemplar questions that were taken from their final exams. They were asked whether they remembered a specific learning episode (episodic memory) that helped them to answer that question, or if they knew the information (semantic memory), both right after the final exam at Time 1, and five weeks later at Time 2. In the second phase in 2017, the same procedure was applied to 86 freshmen and 42 senior students (the ones that had been freshmen in 2014 participated as seniors in 2017). The first set of analyses reveal that the number of remember responses decreased dramatically within three years whereas the number of know responses remained stable. The second set of analyses show that remember-to-know shift occurred only for senior students. This study made contribution by showing the importance of semantic memory in the long-term and the importance of college experience level both cross-sectionally and longitudinally.

PA - 058 Age-related cognitive strategy changes in implicit sequence learning

Noémi Éltető[1], Dezső Németh[1,2]
[1]Eötvös Loránd University, Hungary, [2]Hungarian Academy of Sciences, Hungary

Implicit sequence learning is a crucial ability in all stages of life since it underlies skill acquisition from motor tasks to cognitive and social competences. Janacsek et al. (2012) reported that the developmental curve of implicit sequence learning does not conform to the typical inverted-U shape pattern, but learning is most efficient before 12 years of age and it significantly weakens afterwards. Yet, the qualitative ontogenetic changes that give rise to the quantitative differences in performance are not understood yet. We investigated implicit sequence learning between 4–44 years of age. First, we confirmed that the basic ability of picking up triplets that occur with high- vs. low-probability in the sequence – measured by raw reaction time (RT) - is superior in children and it is decreased around age of 12. Importantly, difference in the variability of RTs for the high- vs. low-probability triplets was

also higher in children, when controlling for the total variability. This suggests that while children have acquired some high-probability triplets but not others, adolescents and adults learned these approximately simultaneously. Moreover, the difference in variability for the high- vs. low-probability events, but not total variability was correlated with the triplet learning measure before 12 years of age. Therefore, we propose that the learning of high probability events per se undergoes a shift in weighting specific events vs. whole probabilistic structures.

THURSDAY, JANUARY 4

POSTER SESSION A
THURSDAY

POSTER SESSION B
FRIDAY

PB - 001 Group Conquers Efficiency: Preschoolers' Imitation under the Conflict between Group Preference and Behavior Efficiency

Yuanyuan Li, Yuang Cheng, Jie He

Zhejiang University, China

PB - 002 Study of the Casual Relationships of Internal Motivation, Attitude to Science, and External Motivation with Academic Performance in the Science Mediated by Conceptual Understanding

S. Abdolvahab Samavi, Ali Akbar Shaikhi Fini, Moosa Javdan

University of Hormozgan, Iran

PB - 003 Error Monitoring in Preschool children: post error slowing and explicit (un)certainty judgements

Claudia M. Roebers Nike Tsalas Sonja Kaelin

University of Bern, Switzerland

PB - 004 Adults and infants infer social relationships according to expectations about derived dominance

Hugo Pantecouteau, Auriane Couderc, Jean-Baptiste Van der Henst, Olivier Mascaro

Institut des Sciences Cognitives Marc Jeannerod, CNRS, France

PB - 005 Acquisition of noun inflection in three languages: The role of input frequency and linguistic complexity

Joanna Kołak[1], Sonia Granlund[1,2], Virve Vihman[1,3], Felix Engelmann[1], Ben Ambridge[2], Julian Pine[2], Anna Theakston[1], Elena Lieven[1]

[1]University of Manchester, UK, [2]University of Liverpool, UK, [3]University of Tartu, Estonia

PB - 006 Verbal feedback is key when training executive control in preschool-age children

Bianca van Bers, Ingmar Visser, Maartje Raijmakers

University of Amsterdam, Netherlands

PB - 007 From babble to words: Infants' early productions match attended objects

Catherine Laing[1], Elika Bergelson[2]

[1]Cardiff University, UK, [2]Duke University, USA

PB - 008 Implicature matters: a developmental approach

Zsuzsanna Schnell

University of Pécs, Hungary

PB - 009 Multiple patterns: A 'wug' task in Estonian with 3 to 5-year-olds

Virve Vihman[1,2], Felix Engelmann[2], Anna Theakston[2], Elena Lieven[2]

[1]University of Tartu, Estonia, [2]University of Manchester, UK

PB - 010 Acquisition of Spatial frames of references: Role played by working memory across pre-adolescent and adolescent years

Sumona Datta, Debdulal Dutta Roy

Indian Statistical Institute, India

PB.e - 011 Maternal depression level, foetal heart-rate and movements, and infant temperament: Correlations in a longitudinal study

Silvia Rigato[1], Manuela Stets[1], Karla Holmboe[1,2]

[1]University of Essex, UK, [2]University of Oxford, UK

PB.e - 012 From thinking to acting prosocial: Social and motor abilities enable infants to help

Moritz Köster[1], Shoji Itakura[2], Masaki Omori[2], Joscha Kärtner[3]

[1]Free University Berlin, Germany, [2]Kyoto University, Japan, [3]University of Münster, Germany

PB - 013 Young children's affective forecasting depends on culture

Erin Robbins

University of St Andrews, UK

PB - 014 Three methodological experiments regarding pragmatic development

Andrea Balázs[1], Anna Babarczy[1,2]

[1]Budapest University of Technology and Economics, Hungary, [2]Research Institute for Linguistics of the Hungarian Academy of Sciences, Hungary

PB - 015 Shy toddlers outperform their peers in visual perspective-taking after training – a matter of experience in being observant?

Franziska Krause, Katharina J. Rohlfing

Paderborn University, Germany

POSTER SESSION B
FRIDAY

PB - 016 Let's do it together! The role of interaction in false belief understanding

Marta Białecka-Pikul, Magdalena Kosno, Arkadiusz Białek, Marta Szpak

Jagiellonian University, Poland

PB - 017 Children's Referential Communication Skills: The Role of Cognitive Abilities and Adult Models of Speech

Berna A. Uzundag, Aylin C. Küntay

Koç University, Turkey

PB - 018 Decategorization Leads Preschoolers to Share the Same With Ingroup and Outgroup Members

Anja Kassecker, Marco F.H. Schmidt

Ludwig-Maximilians-University, Germany

PB - 019 Paternal Questioning in Early Infancy as a Path to Intersubjective Relationships and Learning

Theano Kokkinaki, Dionysia Kroustallaki

University of Crete, Greece

PB.e - 020 Dissociation between Episodic Memory and Future Planning from a Revised 'Spoon Test'

Amanda Seed, James Ainge, Katherine Dickerson

University of St Andrews, UK

PB - 021 Children's attitude towards study materials influences their performance in inhibitory-control tasks

Frances Buttelmann[1], Gisa Aschersleben[2], David Buttelmann[3]

[1]Friedrich Schiller University Jena, Germany, [2]Saarland University, Germany, [3]University of Bern, Switzerland

PB - 022 Development of error and conflict monitoring

Mirela Dubravac, Claudia M. Roebers, Beat Meier

University of Bern, Switzerland

PB.e - 023 Quantity or quality? The association between children's pretend play and their socio-cognitive competencies

Pablo Torres, Silvana Mareva, Jenny Gibson, Elian Fink

University of Cambridge, Cambridge, UK

PB - 024 Theory of Mind Scale - the Hungarian adaptation

Timea Budai, Kata Lénárd, Szabolcs Kiss

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PB - 025 Every rose has its thorn: Infants' behavioral responses to visible plant threats

Aleksandra Włodarczyk[1], Claudia Elsner[1], Aleksandra Schmitterer[2], Annie E. Wertz[1]

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PB - 026 Explanation and disbelief in children's understanding of live versions of fictional characters

Thalia R. Goldstein

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PB.e - 027 The effects of category curiosity and density on early word learning

Lena Ackermann[1], Robert Hepach[2,3], Nivedita Mani[1]

[1]University of Göttingen, Germany, [2]University of Leipzig, Germany, [3]Max Planck Institute for Evolutionary Anthropology, Germany

PB.e - 028 The role of iconic gestures among preschool age children: Comprehension of gesture viewpoints

Kazuki Sekine[1,2]

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Laura Franchin, Luca Surian

University of Trento, Italy

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Karla Koskuba, Anne Schlottmann, Eleana Georgiou

University College London, UK

PB - 031 The role of ownership history in the IKEA effect: Do children extend others as they extend themselves?

Lauren Marsh[1,2], Jessica Fielding[2], Bruce Hood[2]

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Eleanor Jordan, Christoph Völter, Amanda Seed

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PB - 033 Profiling question comprehension in autism spectrum disorders

Elisabet Vila Borrellas[1], Joana Rosselló Ximenes[1], Wolfram Hinzen[1,2,3,4]

[1]Universitat de Barcelona, Spain, [2]Universitat Pompeu Fabra, Spain, [3]FIDMAG Germanes Hospitalaries Research Foundation, Spain, [4]Catalan Institute for Advanced Studies and Research (ICREA).

PB - 034 Audience effect in dogs

Orsolya Kiss, József Topál

Hungarian Academy of Sciences, Hungary

PB - 035 Learning relational language in early childhood

Eylül Turan, Aslı Aktan-Erciyes, Tilbe Göksun

Koç University, Turkey

PB.e - 036 Bilingual Children Show a Preference for the Mouth of A Talking Face: Analysing The Temporal Dynamics

Joan Birules[1], Laura Bosch[1], David Lewkowicz[2], Ferran Pons[1]

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PB.e - 037 New evidence for systematicity in infants' curiosity-driven learning

Han Ke[1], Gert Westermann[1], Ben Malem[1], Katherine Twomey[2]

[1]Lancaster University, UK, [2]University of Manchester, UK

PB - 038 Development of Expectation for Retributive Justice, or "Karma" in childhood

Akiho Yamate, Kazuhide Hashiya

Kyushu University, Japan

PB - 039 Specific episodic memory based eye movement behavior among primary school children

Andrea Marta Hegedűs, Márton Nagy, Ildikó Király

Eötvös Loránd University, Hungary

PB - 040 Children's Explanations of Individual Behavior as a Function of Group Membership

Reut Shilo[1], Anika Weinsdörfer[2], Hannes Rakoczy[2], Gil Diesendruck[1]

[1]Bar-Ilan University, Israel, [2]University of Göttingen, Germany

PB - 041 Action kinematics at 10 months are associated with later social abilities at 14 months in infants at high and low risk for developing autism

Rosanna Edey, Emily Jones, Jannath Begum, Tony Charman, Mark Johnson, Clare Press and the BASIS Team

University of London, UK

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Oytun Aygun[1], Pia Rämä[1,2]

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Buse Atakan[1], Pınar Aydın[1], Melisa Kumar[1], İlayda Yilmaz[1], Cagla Aydin[1], Bahar Köymen[2]

[1]Sabancı University, Turkey, [2]The University of Manchester, UK

PB - 044 Pretend play and narrative creation

Erim Kızıldere[1], Aslı Aktan-Erciyes[1], Deniz Tahiroğlu[2], Tilbe Göksun[1]

[1]Koç University, Turkey, [2]Boğaziçi University, Turkey

PB - 045 Influence of arguments on advice-taking in 4 to 6 year old children

Nadja Miosga, Thomas Schulze-Gerlach, Stefan Schulz-Hardt, Hannes Rakoczy

University of Göttingen, Germany

PB - 046 The influence of language and other background variables on mathematics achievement in Luxembourgish students

Sophie Martini, Sonja Ugen

University of Luxembourg, Luxembourg

PB.e - 047 How great apes adjust their pointing behavior to the physical and social context

Tibor Tauzin[1], Manuel Bohn[2,3,4], Josep Call[2,5], György Gergely[1]

[1]Central European University, Hungary, [2]Max Planck Institute for Evolutionary Anthropology, Germany, [3]Stanford University, USA, [4]Leipzig University, Germany, [5]University of St Andrews, UK

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PB - 048 Representing the presence and the absence of an object in domestic chicks – A violation of expectation paradigm

Eszter Szabó[1], Cinzia Chiandetti[2], Ernő Téglás[1], Gergely Csibra[1], Ágnes M. Kovács[1], Giorgio Vallortigara[3]
[1]Central European University, Hungary, [2]University of Trieste, Italy, [3]Center for Mind/Brain Sciences, Italy

PB - 049 Preschool children reason about artist mental states when naming drawings

Nera Bozin[1], Nicole Yuen[2], Ljubica Marjanovic Umek[3], Erika Nurmsoo[1]
[1]University of Kent, United Kingdom, [2]University of Surrey, United Kingdom, [3]University of Ljubljana, Slovenia

PB - 050 Evidence For Continuity in Relational Reasoning Across Species and Development

Ivan Kroupin, Susan Carey
Harvard University, USA

PB - 051 Reactive aggression and strategic behavior in the prisoner's dilemma game

Meia Chita-Tegmark, Peter Blake
Boston University, USA

PB - 052 How do children treat information from an unreliable source?

Benjamin Schmid, Nivedita Mani, Tanya Behne
University of Goettingen, Germany

PB - 053 3- and 4-year-old children spontaneously use two tools in combination (Associative tool use) to solve diverse tool-use problems

Eva Reindl[1], Ian A Apperly[2], Sarah R Beck[2], Claudio Tennie[3]
[1]University of Oxford, UK, [2]University of Birmingham, UK, [3]University of Tuebingen, Germany

PB.e - 054 The two routes to become a leader: Dominance vs Prestige

Jesús Bas, Núria Sebastián-Gallés
Universitat Pompeu Fabra, Spain

PB - 055 Spatiotemporal vs Conceptual object individuation

Gábor Bródy, Gergely Csibra
Central European University, Hungary

PB - 056 Do non-human great apes show susceptibility to others' beliefs in a manual search task?

Dora Kampis[1], Ildikó Király[1,2], György Gergely[1], Ágnes M. Kovács[1], Africa de las Heras[3], Josep Call[3]
[1]Central European University, Hungary, [2]Eötvös Loránd University, Hungary, [3]University of St Andrews, UK

PB - 057 The Role of Native Speaker Preference on Infants' Learning of Novel Tunes

Didar Karadağ[1], Gaye Soley[1], Nuria Sebastián-Gallés[2]
[1]Boğaziçi University, Turkey, [2]Pompeu Fabra University, Spain

PB - 058 Infants' perception of multi-person scenarios

Justine Epinat-Duclos, Liuba Papeo, Jean-Rémy Hochmann
CNRS, France

POSTER SESSION B
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PB - 001 Group Conquers Efficiency: Preschoolers' Imitation under the Conflict between Group Preference and Behavior Efficiency

Yuanyuan Li, Yuang Cheng, Jie He
Zhejiang University, China

Lots of literatures have found that there is an in-group preference in preschoolers' imitation. Moreover, preschoolers' imitation is also guided by the efficiency of behaviors. They tended to imitate deterministically rather than probabilistically effective modeled actions. Here comes our question, what if group preference contradicts behavior efficiency, which element would be more important? The main goal of this study is to investigate preschoolers' tendency of imitation under such circumstance with the conflict between group preference and behavior efficiency. Participants were 4-year-old (N = 72) and 6-year-old (N = 72) preschoolers in China. They observed two demonstrators (one in-group and one out-group) pressing two different buttons respectively to turn on a music box and were then asked to try with it. In the experimental condition, the out-group demonstrator always succeeded while the in-group demonstrator failed 2 of the 4 times. The result showed that older children tended to imitate the less effective behaviors done by the in-group demonstrator while younger children imitated randomly. When children were asked about their individual preference and the demonstrators' trait, most of the children preferred those they had imitated and thought the more efficient demonstrator clever. In addition, two control conditions were conducted to ensure that children really preferred the in–group to out-group members (Control 1: both in-group and out-group demonstrators succeeded 4 times) and can imitate behaviors according to efficiency (Control 2: two in-group demonstrators respectively succeeded 2 and 4 times). These results indicate that 6-year-olds seemed to obey in-group convention regardless of efficiency.

PB - 002 Study of the Causal Relationships of Internal Motivation, Attitude to Science, and External Motivation with Academic Performance in the Science Mediated by Conceptual Understanding

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University of Hormozgan, Iran

The purpose of the present study was to examine the model of causal relationships of internal motivation, attitude to science, and external motivation with academic performance in the science mediated by conceptual understanding in grade 8th male and female students in Darab city, Iran. The sample consisted of 390 students in 8th grade who were selected by multistage random sampling. Three questionnaires have been used for collecting data, modified Harter academic motivation questionnaire, Akbari school attitude questionnaire, and Researcher-Made Conceptual Understanding Test. The proposed model was tested by using structural equations modeling method. The result showed that all the path coefficients were significant. The relationships of internal motivation, attitude to science and external motivation with academic performance in the science were positive and significant. The relationships of internal motivation, attitude to science with conceptual understanding were also positive and significant. But the relationship of external motivation with conceptual understanding was not significant. The relationship of conceptual understanding and academic performance in the science was positive and significant. Indirect paths were also tested using the bootstrapping method. The results showed that all indirect hypotheses except for the third hypothesis (the indirect relationship between external motivation and academic performance in the science mediated by conceptual understanding) had been confirmed.

PB - 003 Error Monitoring in Preschool children: post error slowing and explicit (un)certainty judgements

Claudia M. Roebers Nike Tsalas Sonja Kaelin
University of Bern, Switzerland

Error monitoring and the awareness of uncertainty are considered to be the basis for any self-regulation of cognitive activities, including perception, learning, and memory. Recent evidence suggests that much earlier than traditionally assumed, young children can introspect on their performance, can experience uncertainty and can also act on this uncertainty to the benefit of task performance (Goupil & Kouider, 2016; Goupil, Romand-Monnier, & Kouider, 2016; Hembacher & Ghetti, 2014; Lyons & Ghetti, 2013). While for young children, the traditional, explicit, verbal measures of uncertainty monitoring are found to be not optimally suited, neuro-imaging data (e.g., EEG) are not easily available. In this context, "post error slowing" (mostly studied within tasks of executive functioning) has been suggested to be a suitable research approach to non-verbally capture a behavioral correlate of error monitoring (like EEG - N200 signals) in young children (Roebers, 2017). The to-be-presented study included explicit, verbal measures of monitoring (confidence judgments) and response latencies in two different, child-appropriate executive functioning tasks (a Stroop task and a Flanker task). Children aged between 4 and 6 years were tested and preliminary analyses reveal significant post-error slowing in the executive functioning tasks already in the youngest participants. Moreover, the ability to explicitly and verbally report uncertainty was positively related to post error slowing. Children who hesitated longer were those who discriminated better between correct and incorrect responses in their confidence judgments. Findings will be discussed with respect to a common ground of early metacognition and executive functioning

PB - 004 Adults and infants infer social relationships according to expectations about derived dominance

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Institut des Sciences Cognitives Marc Jeannerod, CNRS, France

In many human and animal societies, individuals do not become dominant just because of their own personal characteristics (e.g., their physical strength). They can also “derive” their dominance status from alliance relationships, for instance when an individual dominates other people by virtue of being allied with someone outranking these people. Derived dominance plays a crucial role in shaping social structures, rank inheritance, or relationships between groups. Yet, the role of expectations about derived dominance in humans’ social reasoning has not been investigated directly. We address this issue in two studies.
In Study 1 (N = 60), a paired-associates learning paradigm confirms that adults draw inferences consistent with dominance being derived. In Study 2 (N = 32), we probe the ontogeny of these inferences with a looking time paradigm. In the experimental condition, we familiarize 14-month-olds to 2D animations showing that (i) one agent is dominant over another one, and that (ii) the dominant and the subordinate agent each have a different ally. During test, infants look significantly longer when the subordinate’s ally prevails over the dominant’s ally than when the opposite happens ($t(15) = -3.00$, $p = .009$). This pattern of looking time is disrupted in a control condition in which participants receive ambiguous information about agents’ alliances. These results suggest that infants infer unknown social relationships according to expectations about derived dominance. Our data reveals that systematic expectations about the way alliances and dominance interact guide the discovery of social structures from infancy on.

PB - 005 Acquisition of noun inflection in three languages: The role of input frequency and linguistic complexity

Joanna Kołak[1], Sonia Granlund[1,2], Virve Vihman[1,3], Felix Engelmann[1], Ben Ambridge[2], Julian Pine[2], Anna Theakston[1], Elena Lieven[1]
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This study investigates the development of morphosyntactic competence in children acquiring morphologically complex languages, relating this development to input frequency and linguistic structure. Studies have shown that token frequency and phonological neighbourhood density (PND) impact on rates of learning (Ambridge et al. 2015). Various aspects of linguistic complexity like analysability, salience and regularity have also been shown to play a role, but it is not clear how these may differ across languages and how they interact with frequency.
We elicited nominal case forms from 132 children (32–63 months) acquiring Estonian, Finnish or Polish. Participants were shown pictures of characters interacting with objects in 5 (Polish) or 6 (Estonian and Finnish) contexts requiring various case-marked forms. In each language we tested nouns varying in form frequency, with three nouns from each of 8-10 declension classes. The study was preregistered. We expected to find greater accuracy predicted by higher form frequency and larger PND in the input.Accuracy improved with age in all languages. As expected, we found interactions between frequency and PND for Estonian and Polish (Estonian: $\beta=-0.17$, $SE=0.06$, $\chi^2(1)=7.03$, $p=0.008$; Polish: $\beta=-0.10$, $SE=0.05$, $\chi^2(1)=3.90$, $p=0.048$), with a greater PND effect for lower than for higher frequency tokens; and a positive main effect of PND for Finnish ($\beta=0.34$, $SE=0.23$, $\chi^2(1)=4.38$, $p=0.04$). We also explored whether measures of linguistic complexity (distinctiveness, stem change complexity and syncretism) influenced accuracy and we found that the results were mediated by the typological features of each language. We discuss implications for usage-based theories of acquisition.

PB - 006 Verbal feedback is key when training executive control in preschool-age children

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Executive control is an umbrella term for a set of cognitive abilities that underlie flexible goal-directed behavior. The development of executive control during early childhood is predictive of important developmental outcomes. In a series of experiments, we showed that a very brief intervention can improve executive control in preschool-age children significantly.
We studied the effects of feedback on preschoolers’ sorting behavior in a computerized version of the DCCS task. A paradigm frequently used to study executive control in preschool-age children. In the first three experiments the feedback consisted of a combination of verbal feedback, demonstration of the correct way of sorting and computer feedback. Results showed that children in the feedback condition performed better than children administered a standard DCCS task. This effect transferred to a subsequent standard DCCS task.
In two other experiments the three feedback factors were studied separately and in all possible combinations with a full factorial design. Results showed that children receiving verbal feedback performed better than children administered a standard DCCS task and children receiving only demonstration of the correct way of sorting or computer feedback. This effect transferred to a subsequent standard DCCS task with the same sorting rules and with different sorting rules.
Results of this series of experiments suggest that executive control in preschool-age children can be trained using a very brief intervention, verbal feedback. Implications for the different accounts that have been proposed for the cognitive processes that underlie age-related changes on the DCCS task will be discussed.

PB - 007 From babble to words: Infants' early productions match attended objects

Catherine Laing1, Elika Bergelson2

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Stable consonants in infants' babble, termed 'vocal motor schemes' (VMS, McCune & Vihman, 2001), help guide early language perception (Majorano et al., 2014); infants with one VMS attend longer to words containing that consonant. Building on this, we examine whether babbling inventory influences infants' productions towards surrounding objects. We compare the babble of infants with and without VMS, in relation to objects attended to during production.

Using the SEEDLingS corpus (Bergelson, 2016a,b), we determined infants' VMS from audio recordings at 10-11 months (criteria from DePaolis et al., 2011). 22 infants had a VMS consonant (withVMS), and 22 had not yet established a VMS (noVMS). We then analyzed an hour of home-recorded video data taken on a different day than the audio recording. Each consonant the infant produced was transcribed, and we noted any object that the infant attended to during production.

We determined whether infant consonant productions were phonetically congruent with the attended object (e.g. infant produces /bə/ while attending to a ball). Indeed, withVMS infants produced object-congruent consonants 57% of the time, vs. 30% of the time for noVMS infants ($p<.001$ by Wilcoxon Test). Next, looking only at withVMS infants, we examined the degree to which the consonants they produced matched their VMS (inVMS vs. outVMS). 67% of object-congruent consonants were inVMS; significantly more than were outVMS (30%; $p<.001$ by Wilcoxon Test).

These results suggest that infants move towards word production via the perceptual filter of consonants rehearsed and stabilized through (non-referential) babble.

PB - 008 Implicature matters : a developmental approach

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Background: Limited research has examined children's understanding of the Gricean maxims and sometimes results are controversial (Eskritt – Whalen – Lee 2008). The central claim of the present research is that mentalization plays a significant role in inferential (Sperber 2000, Pléh 2000 Grice 1975), i.e. pragmatic meaning construction. The study, based on an experimental design (Schnell et al. 2016, Sperber-Noveck 2004) aims to clarify the relation between mentalization and maxim infringement, drawing up a developmental trajectory of the maxims. Aim: children's conversational skills and pragmatic competence is examined in view of their mentalization skills in an experimental paradigm, targeting their abilities of recognizing the infringements of the Gricean conversational maxims. Method: we measure preschoolers' ToM performance with a first order ToM task (Baron-Cohen 1985) and a second order ToM task (Baron-Cohen 1995), and compare participants' ability to recognize the infringement of the Gricean maxims in view of their social cognitive skills.Results:Theory of Mind proved to be a significant factor in predicting the group's performance. The development and the smooth operation of the cooperative skill of pragmatic competence was heavily based on social-cognitive abilities. Conclusions: The results shed light on the cognitive effort needed for the deciphering of the implied pragmatic meaning, for which mentalization based inferential mechanisms play a key role. Levels of mentalization correspond to pragmatic levels (Sperber –Wilson 1995, Sperber 2000), in harmony with Sperber's (2000) levels of metarepresentation: (1) mindreading (metapsychological), (2) pragmatic (metacommunicative) level, and (3) argumentative (metalogical) (Wilson 2009).

PB - 009 Multiple patterns: A 'wug' task in Estonian with 3 to 5-year-olds

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This study probes children's ability to generalise knowledge of the complex nominal case morphology of Estonian. The language learner faces several challenges: (a) multiple declension classes are productive and frequent; (b) classes are not entirely phonologically predictable; (c) some patterns involve stem changes, which have been shown to be more difficult than affixes (Kjærbæk et al. 2014). We conducted a sentence completion task with 69 Estonian-speaking children aged 3–5 years and an adult control group. We used pictures to introduce novel nouns in one of two cases, following Krajewski et al. (2011), and to elicit genitive and partitive forms, in order to investigate (1) how participants inflect novel nouns, (2) how presentation and target case affect responses, and (3) whether we see developmental differences. Allative case contains more morphological information regarding declension class than nominative, and was expected to facilitate accuracy. Genitive case was predicted to be easier than partitive, regardless of presentation case, because of greater consistency. Results showed no significant effect of presentation case. Target case ($p < .001$) and age ($p = .007$) were significant predictors of accuracy, with an interaction between them ($p = .011$): 5-year-olds were more accurate with the more consistent genitive than partitive formation. Despite low overall accuracy, even 3-year-olds used the same predominant patterns as adults. Responses indicate that no single declensional rule underlies generalisation in Estonian (cf Mirkovic et al. 2011). Young children and adults base generalisation on analogy, showing sensitivity to multiple factors involved in noun inflection.

PB - 010 Acquisition of Spatial frames of references: Role played by working memory across pre-adolescent and adolescent years

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Orientation in space requires successful acquisition of spatial frames of references (FoR) and a high capacity of holding and processing information. Maturation of brain processes during adolescence (Steinberg, 2005) and linear expansion in functional capacity of working memory (WM) with matura-

tion (Gathercole et al., 2004) further accentuates this process. Present study tested this hypothesis among typically developing pre-adolescents and adolescents. Participants (N=270) completed a paper-pencil spatial orientation task (SOT; α=0.90), developed for this study, along with measures of verbal and visuospatial WM. The SOT consisted of multiple-choice problems developed to assess the egocentric, object-centered and allocentric FoRs. Items included spatial map with landmarks where respondents have to orient themselves following internal and external frames. We found higher acquisition ($p<0.000$) of FoRs in adolescents (Mean-age= 14.00 years; SD=1.42) as compared to pre-adolescents (Mean-age= 9.22 years; SD=1.41). Development of egocentric FoR levelled off by middle adolescence, while the other FoRs expanded linearly till late adolescence. This might be because egocentrism emerges earlier in life as compared to other external frames (Nardini et al., 2006). We also found linear association between SOT and WM capacity ($p<0.01$). Among pre-adolescents, SOT is significantly explained by verbal WM ($p<0.01$) but not visuospatial WM ($p=0.268$). Contrastingly, among adolescents, both verbal and visuospatial WM significantly ($p<0.000$) predicted SOT performance. When age was partialed out, association between SOT and WM remained unaffected among pre-adolescents, but it dropped among adolescents. Results suggested the role of brain maturation and WM capacity expansion in the acquisition of spatial FoRs.

PB.e - 011 Maternal depression level, foetal heart-rate and movements, and infant temperament: Correlations in a longitudinal study

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In a longitudinal study on two major aspects of infant cognitive development (attention and social cognition), we tracked 60 infants from the last trimester of pregnancy to 9 months of age using a range of methodologies such as behavioural measures, eye-tracking, and EEG/ERP. Maternal depression and infant temperament were also assessed using well-validated questionnaires. First results indicate that infant negative affect is strongly related to mothers' depression level shortly after birth. In fact, a raised maternal depression score within the first weeks after birth is positively correlated with infant negative affect at birth, 4, 6 and 9 months. This indicates the importance of maternal mental health in this sensitive period shortly after birth and its impact on infant development. Additionally, maternal depression level at 4 months is associated to infant negative affect at 6 and 9 month, ad maternal depression at 6 months predicts negative affect at 9 months. We also collected heart-rate and movements data from the infants prenatally as these have been used as additional measures to assess infant behaviour and cognition. We found that foetal heart-rate is related to negative affect later on, so that fetuses with lower heart-rate are more irritable at 6 months, and that foetal movement negatively predicts falling reactivity, so that fetuses that move a lot take longer to calm down at 9 months of age.

PB.e - 012 From thinking to acting prosocial: Social and motor abilities enable infants to help

Moritz Köster[1], Shoji Itakura[2], Masaki Omori[2], Joscha Kärtner[3]

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Which are the critical developments underlying infants' earliest helpful actions? Infants understand others' needs already in their first year, but they only begin to help others around their first birthday. Here, we tested the hypothesis that the transition from thinking prosocial to acting helpfully is established by infants' motor and social interaction skills that emerge around the first birthday. We assessed infants' understanding of others' needs using an eye-tracking paradigm at 10 months ($n = 41$) and at 16 months ($n = 37$) and assessed 16-month-olds' helping behavior, motor abilities and social skills with classical behavioral tasks. The results confirmed that, first, 16-months-olds' fine motor abilities and social interaction skills moderated the association between prosocial understanding and helping behavior. Second, fine and gross motor abilities and social skills as such predicted helping behavior. Finally, we could replicate to the most part that infants of both age groups understand others' needs. These results indicate that 16-month-olds orient their help at others' needs, as soon as they can, and thus provides first evidence for a prosocial motivation underlying infants' helpful acts, early in the second year. However, we also identified two further critical developmental attainments that contribute to infants earliest prosocial actions, namely their motor development and their social interaction skills.

PB - 013 Young children's affective forecasting depends on culture

Erin Robbins

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We examined how affective forecasting—e.g. overestimating the negativity associated with having less (loss aversion; Kahneman & Tversky, 1986)—motivates children's sharing. 5-7 year-olds (total N=90; N=45 in US and Samoa) learned to accurately estimate the height of cereal in a transparent tube as 1 scoop (100g) was added (gain) or removed (loss). Next, a sleeve fit over the tube rendered it opaque, and children again estimated how much they (or a partner) had won or lost. In a counterbalanced sharing task, children also distributed cereal between themselves and an anonymous partner. We anticipated children of both cultures would overestimate losses relative to gains, that this overestimation would predict selfish sharing, and that this bias would be more apparent in the US context that emphasizes individuality and competition over egalitarianism. US children were more accurate estimating another's gains/losses than their own: 5 year-olds overestimated personal losses and by 7 children demonstrated loss aversion by overestimating loss and simultaneously underestimating gains for themselves. Additionally, the magnitude of asymmetry predicted sharing behavior: children who overestimated loss were more selfish. In contrast, Samoan children overes-

timated personal gains at both ages. The tendency amongst US children to self-maximize may be based on over-inflated perception of personal losses relative to gains. That this asymmetry does not extend to estimations for others may explain why children tend to be more equitable in third party sharing (Olson & Spelke, 2008). An inversion of this trend in Samoa suggests that affective forecasting may depend on culture.

PB - 014 Three methodological experiments regarding pragmatic development

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Our previous study looked at the correlation between the maturity of pragmatic interpretation, executive functions and ToM ability (Babarczy & Balázs, 2016). We found that children with more pragmatic (more adult like) responses performed better on executive functions and ToM tests. This correlation, suggests that reducing the cognitive load of the pragmatic test will result in more pragmatic responses (Foppolo, F., & Guasti, M. T. , 2012).
In the light of this, we proposed to lower the cognitive load by reducing memory load. In the first experiment one picture was presented with three auditory sentence stimuli. One of them was an unequivocally true description of the picture, one was more or less true and one was clearly false. In the second experiment one picture was presented with two auditory sentences. In the third experiment only one sentence was presented with three alternative pictures to rank. The sentence gave three descriptions. There were an unequivocally true, a more or less true, and a clearly false description of one of the pictures. Adults and four-year-olds were tested in each experiment.
We found that the pattern of the answers of the child group differed from the adult group in the first and the third but not in the second experiment. Although, half of the children performed the third experiment in an adult like way. This means that even young children can understand the pragmatic use of language if they are not overloaded by the design of the experiment.

PB - 015 Shy toddlers outperform their peers in visual perspective-taking after training – a matter of experience in being observant?

Franziska Krause, Katharina J. Rohlfing
Paderborn University, Germany

While it is widely associated with hesitation in and withdrawal from social situations, recent research suggest that shyness provides a benefit in social-cognitive development: Studies could demonstrate that level of shyness at 18 months predicted theory of mind abilities at three years (Mink et al., 2014) and correlated with the ability of taking the perspective of an interlocutor in 19-month-olds (Krause et al., 2016). Yet, it has not been investigated whether this relation is due to the temperament characteristic or the experience in being observant.
In our study, we therefore asked whether a training in observant behaviors in 19-month-olds that are less shy and thus less observant will result in better perspective-taking abilities. We further investigate whether shyer children that are more proficient in perspective-taking tasks would gain even more from the intervention.
Based on a questionnaire, we divided children (N = 44) into three categories of shyness: low – moderate – high (Spere et al., 2009). Visual perspective-taking was measured at two points (pre-post) by using a helping task. In between, children participated in a training that aimed to ameliorate their observational skills.
At pre-test, groups of children did not differ significantly from each other. After training, the values in the post-test remained quite stable for the non-shy and moderately shy group, but contrasts revealed a significant gain in perspective-taking in the highly shy group ($p = 0.05$). These results suggest that at the age of 19 months, shy children can benefit from a training in perspective-taking.

PB - 016 Let's do it together! The role of interaction in false belief understanding

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From the interaction theory perspective (e.g. Froese & Gallagher, 2012) we aimed to prove that the interactive context of measuring theory of mind allow children younger than 4 to pass false belief test (FBT). Therefore interactive FBT, in which children were actively engaged in the story, was devised, and 210 children were tested twice, i.e. when they were 3 and 3.5 year old. Results have shown that 28% of 3-year-olds and 59% 3.5-year-olds passed the interactive FBT, while only 37% of older group passed classic FBT. Additionally, passing the interactive FBT almost four times increases the chance of passing classic FBT. We conclude that interactive mode of FBT, facilities false belief understanding in children younger than 4 years of age.

PB - 017 Children's Referential Communication Skills: The Role of Cognitive Abilities and Adult Models of Speech

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Young children often produce ambiguous referring expressions and need to repair communication to achieve clarity. Hearing adults' descriptions of referents among similar competitors may help children to develop clearer expressions (e.g. Ateş-Şen & Küntay, 2015; Matthews, Lieven, & Tomasello, 2007). We examined the impact of hearing adults' informative referring expressions and the role of children's cognitive skills in their initial and repairing expressions in a referential communication task. In a pre-

test-training-posttest design, we tested children (ages 4;0 – 5;9) on their ability to request certain stickers among competitors. During the training, 30 children heard uniquely identifying informative descriptions in the form of relative clauses (e.g. “you selected the horse that the boy is riding”), and 29 children heard less informative descriptions as demonstrative noun phrases (e.g. “you selected that horse”). Additionally, we measured children’s short-term and working memory with forward and backward digit span tasks, executive functions via the Dimensional Change Card Sort (DCCS) task, and theory of mind with contents false belief task. Mixed-effects analyses showed that children who heard more informative messages showed a greater increase in uniquely identifying initial descriptions (Estimate=1.18, SE=0.50, p=.018). Communicative repair skills were related to backward digit span (Estimate=-0.19, SE=0.08, p=.027) and DCCS (Estimate=-0.46, SE=0.18, p=.013) tasks. Results indicate that informative language structures that uniquely identify referents act as a model for children for effective communication, and working memory and executive functions also play a role.

PB - 018 Decategorization Leads Preschoolers to Share the Same With Ingroup and Outgroup Members

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Humans are not only social, but also cultural creatures who identify with their own group and engage in within-group cooperation (Baumeister & Leary, 1995; Deci & Ryan, 2008; Tomasello, 2010). The tendency to think in terms of social categories – “us” and “them” – may lead to enhanced prosocial behaviors toward members of our own group as compared with outgroup individuals (ingroup favoritism), or even to outgroup discrimination and prejudice (Rutland, Killen, & Abrams, 2010; Tajfel & Turner, 1986). One powerful candidate to overcome ingroup bias and parochialism is decategorization (Brewer, 1996; Cameron et al., 2006), that is, the process that leads people to see others as individuals rather than as members of a category, for instance, by stressing individuating information about category members. Here we investigated preschoolers’ responsiveness to decategorization using a dictator game to measure children’s prosocial behavior in an intergroup context. Five- to 6-year-olds (N=80) had the opportunity to share stickers with an ingroup or an outgroup member. The recipient was presented either in an impersonal way (focus on category membership) or in a personal way (focus on individuating information, e.g., name and personal preferences). Children shared more stickers with ingroup versus outgroup members when category membership was emphasized, but they shared equally when the recipients were presented as individuals, $F(1,78)=4.33$, $p< .05$. These findings suggest that the presentation of outgroup members as individuals may be a powerful tool to reduce ingroup bias and to foster equal treatment of ingroup and outgroup members in preschool children.

PB - 019 Paternal Questioning in Early Infancy as a Path to Intersubjective Relationships and Learning

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Objective: This longitudinal and naturalistic study investigated infant and paternal emotional facial expressions accompanying questions, declaratives and directives addressed to young infants in the course of spontaneous father-infant interaction in the naturalistic setting. Method: Eleven infants were observed during their natural dyadic interactions with their father at home from the second to the sixth month of life. Coding: Paternal infant-directed speech was transcribed and categorized into focus categories and thematic sequences. Each focused thematic sequence was assigned to one (or more) of three categories of syntactic structure: questions, declaratives and directives. Within each focused thematic sequence, microanalysis of infant and paternal facial expressions of emotion was carried out according to the type, the frequency, the valence and the intensity of them. On this basis, emotional coordination was evaluated with: synchrony, matching, completion and attunement. Preliminary Results: Statistical analysis on the relationship between infant and paternal emotional coordination according to syntactic structure showed that paternal questions were accompanied by more frequent, more accurate and more intense emotional coordination of facial expressions compared to declaratives and directives. Conclusion: We propose that in the frame of the theory of innate intersubjectivity, paternal questions addressed to young infants constitute examples of intersubjectivity - the process in which mental activity, including emotions, is transferred between minds in interactions of young infants with their fathers. This may have implications for all partners’ ability to regulate and negotiate interpersonal challenges in the present, and for the lifetime experience of learning participation in a society of different personalities.

PB.e - 020 Dissociation between Episodic Memory and Future Planning from a Revised ‘Spoon Test’

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The ‘spoon test’, a non-verbal paradigm for evaluating episodic future thinking, presents participants with a problem and later the opportunity to secure its solution in another context. One criticism of this methodology is that participants may form a positive association with the object needed to solve the task before the test occurs, which could lead them to select the target object without needing episodic cognition. We developed a task that rules out this alternative explanation. Children (n=212) first learned to operate two different ‘vending machines’, which each needed the addition of a specific token to dispense stickers. They were then told that only one of the boxes would be available again. After completing another test in a neighbouring room, they were offered the two previously-useful

tokens and a novel one. Five-, 6- and 7-year-olds were able to select the right token for the available box at above chance levels, but 3- and 4-year-olds were not. We showed that the training phase was not too complicated: 4-year-olds (n=20) passed the task when we provided the target token alongside distractors that had never been useful, similar to previous studies. We also showed that episodic memory is not sufficient for success: 4-year-olds (n=20) had an intact memory for which box was still available, and chose the right token when in front of the box. We suggest that positive association substantially impacts performance on item-choice tasks in 4-year-olds, and that future planning may have a more protracted developmental trajectory than previously thought.

PB - 021 Children's attitude towards study materials influences their performance in inhibitory-control tasks

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Research from different fields revealed that the affordances of study materials might have a significant influence on children's performance at test (Morrison & Rosales-Ruiz, 1997; Suchman & Trabasso, 1966). More specifically, previous studies on children's inhibitory control using different objects as rewards showed that 3-year-olds' performance varied (Apperly & Carroll, 2009). However, irrespective of such findings, the potential influence of children's attitude towards stimulus materials on their performance in these tasks is still unknown.
In the current study, we investigated whether children's attitude towards the stimulus materials influenced their performance in a popular inhibitory-control task. Four- (N=43) and five-year-olds (N=53) completed the windows task. In order to receive a reward, children had to point to an empty box (instead of the box containing an object). In the preference task, we assessed children's preferences for the test objects used in the windows task.
Results showed that 5-year-olds' performance in the windows task differed according to whether the more (83.0% of children correct) or the less favored reward-objects (74.5% of children correct) were used (T+= 15.0, N = 53, p = .048, r = .27). In contrast, 4-year-olds' attitude towards a test object did not influence their performance (preferred objects: 40.9% correct, SE = 6.9; non-preferred objects: 40.5% correct, SE = 6.8; T+= 10.0, N = 43, p = .916).
Thus, children's attitude towards the stimulus materials has significant influence in a variety of tasks on social cognition. This effect is age-dependent for measures of inhibitory control.

PB - 022 Development of error and conflict monitoring

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In many domains of cognitive development, a child's growing ability to detect committed errors or to monitor performance is thought to be a driving force for developmental progression. One early aspect of emerging monitoring skills that is currently discussed in the literature is the so called post error slowing effect. However only little research has been done on the relationship between error and conflict monitoring in children leaving the question of shared monitoring processes alerting the system that some adaptation is needed open. The aim of the present study was to close this gap by comparing the after-effects of conflict to the performance-slowing down after errors. Participants of four different age groups (8-,10-,12- year olds and young adults) completed modified Stroop and Simon tasks that provoke relatively frequent mistakes (accuracy around 70-80%). Preliminary results suggest a decrease in the post error slowing effect with age. Further support for the assumption of shared monitoring processes comes from the analysis of the post conflict slowing effect, which follows a similar developmental trajectory as the post error slowing effect. Our study highlights the importance of error and conflict processing for child development.

PB.e - 023 Quantity or quality? The association between children's pretend play and their socio-cognitive competencies

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Research relating children's social pretend play to the development of socio-cognitive competencies has been inconsistent (Lillard et al., 2013). In the current study we explore whether such inconsistency in past results could be in part due to the way pretence has been operationalized in terms of its quantity or quality. 183 children (M age = 5.13 years; SD = 0.39) were observed while playing in pairs. Quantity of pretence was measured through frequency of children engagement in negotiating pretence explicitly, implicitly, or simply enacting pretence (exhaustive coding of mutually exclusive categories; Kappa = 0.74). Quality of pretence was measured by qualifying the sophistication of children's pretence (a range from isolated transformations to coherent pretend stories; Krippendorff alpha = 0.84). Preliminary analysis show that neither overall quantity nor quality of pretence predicted children's theory of mind (as measured by false belief) or teacher-reported social skills (SS) after controlling for age, gender and language ability. Post-hoc analyses, however, showed that the quantity of the individual types of pretence behaviours rather than overall pretence quantity were better predictors of socio-cognitive competencies. Specifically, greater frequency of pretence enactment was found to be negatively associated to children's theory of mind, and positively associated with SS. Additionally, frequency of implicit pretence negotiation (a.k.a implicit metacommunication) was

positively associated to SS. Results suggest the importance of children engagement in specific types of pretend play practices for the development of socio-cognitive competencies.

PB - 024 Theory of Mind Scale - the Hungarian adaptation

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Understanding other persons' mental states (mindreading) is a key component in cognitive development. In the last decades children's theory of mind abilities has been in the focus of many research studies, and they mostly examined mindreading through false belief tasks. Wellman and Liu (2004) found evidence of a sequence in the developmental progression of theory of mind abilities, and developed a series of verbal tasks called the Theory of Mind Scale. According to their findings the developmental sequence of mindreading is the following: diverse desires are easier than diverse beliefs, which is said to be easier than knowledge access, which is easier than understanding false belief, which is easier than understanding that people can feel somehow on the inside and can look different on the outside (hidden emotion). Moreover, we also added a new sarcasm task, as seen in Peterson, Wellman and Slaughter (1012). Our goal is to examine the previously found sequence on a Hungarian sample, first on neurotypically developed children, later on deaf children of hearing families. In our current study, 75 typically developed children, aged 3 to 5 years took the series of theory of mind tasks and the added sarcasm task.

PB - 025 Every rose has its thorn: Infants' behavioral responses to visible plant threats

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Infants differentially attend to and learn about threats such as dangerous animals and angry faces. Little is known, however, about infants' reactions to ancestrally recurrent dangers in broader naturalistic contexts. Although they may seem harmless, plants produce toxic chemical defenses against herbivores, some of which can be quite dangerous to humans. Further, there are no visual cues that reliably indicate the presence of such toxins. Accordingly, prior studies by Wertz & Wynn (2014) showed that infants are reluctant to touch benign-looking plants compared to other entities. This behavioral strategy would minimize infants' physical contact with unknown plants and therefore reduce their exposure to potential plant dangers. Here we explored whether infants' reluctance to touch plants would be influenced by the presence of visibly threatening features (e.g., thorns). Eight- to eighteen-month-olds (N=42) were presented with a series of 12 stimulus objects—plants, novel artifacts matched to features of the plants, and familiar artifacts—with and without thorns. Infant's latency to touch each object, and the frequency and duration of their subsequent touches, were coded. The results showed that infants took longer to reach out and touch plants versus other object types, replicating previous findings, and spent less time touching plants than artifacts. However, there were no differences in infants' touch latencies or touch durations for plants with and without thorns, suggesting that infants treat all plants as potentially dangerous whether or not they possess visible indicators of threat. This behavioral avoidance strategy would mitigate plant harm and facilitate subsequent social learning.

PB - 026 Explanation and disbelief in children's understanding of live versions of fictional characters

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Conceptual understanding of fiction and reality develops throughout the preschool years. However, occasionally children are exposed to a boundary blurring activity: a live version of a fictional or magical character, such as Cinderella at Disneyland or Santa Claus at a public Mall. In two studies, we explored how parents explain such strange real-life appearances, children's questions, and how conceptual understanding of such characters is bolstered.
In Study 1, 197 parents described when their children began to disbelieve in Santa Claus. A regression with age of disblief as the outcome and parental promotion of Santa and visits to live Santas as predictors was significant, $F(2, 78)=9.141$, $p<.01$. Age was positively associated with amount of parental promotion of Santa, ($B=.408$, $p<.001$), but not number of Live Santas visited ($B=.088$, $p=.412$).
In Study 2, 159 parents described their children's reactions to live fictional characters. Very few children (<8%) asked questions about the character's reality status, but 84% did discuss where the character went when leaving the interaction area. Explanations did not vary in magical content by age, $F(1, 150)=.007$, p=ns, or where the interaction occurred (private/public space, $F(2, 145)=.894$, p=ns). However, children's explanations did vary by kind of character. Children gave more magical explanations for less (versus more) realistic characters, $F(1,145)=5.414$, $p=.021$.
Parents' testimony, but not direct experience, may have an effect on children's conceptual development of live fictional characters and use of magical explanations may be dependent on who children are trying to explain

PB.e - 027 The effects of category curiosity and density on early word learning

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Does children's curiosity for a particular category (e.g., animals, vehicles) impact their learning of novel members of these categories? If so, then not only would curiosity impact their learning of novel members, but might also influence the semantic density of categories in the child's vocabulary: Children should know more words in the categories they are more interested in.
Here we investigate the influence of category curiosity and category density on the acquisition of new word-object-associations. 30-months-olds (n=22) were, first, presented with 16 familiar objects from two broad (M = 31 members) and two narrow (M = 11 members) categories and heard their corresponding labels while their pupil dilation response was measured as an index of their interest in members of the different categories. Next, they were exposed to novel members from each of the four categories and tested on their learning of the new word-object-associations. In addition, a vocabulary questionnaire and a questionnaire on the child's interests in different category members were administered.
Analyses indicate that children are able to learn novel members from both broad and narrow categories, but learning is more robust in the broad categories. This suggests that children are able to leverage their existing semantic knowledge to learn new words, which is in line with previous research. Ongoing pupil dilation analyses will then examine the extent to which learning and category size is impacted by children's inherent curiosity in objects from a particular category.

PB.e - 028 The role of iconic gestures among preschool age children: Comprehension of gesture viewpoints

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Caregivers interact with their children usinga variety of modalities such as eye gaze or gestures. In particular, hand gestures are often used by caregivers to convey information along with or in place of speech. However little has been known about what type of gestures children easily understand. Thus, this study examined which gesture types are easy to understand for children, by focusing on gesture viewpoint. Gestures can be categorized into two types in terms of a speaker's viewpoint reflected in their gestures. If a speaker acts out a movement as if he/she had become the character, the gesture is coded as a character viewpoint (CVPT) gesture. If a gesture captures an event from the viewpoint of an observer, it is called an observer viewpoint (OVPT) gesture. 3- and 4- year-olds were presented video clips where the actor depicted one of the children appearing in a picture

using speech and either gesture type. After each video, the child was asked to point which child was depicted by the actor from the children drawn in the picture. The result showed that 4-year-olds performed better than 3-year-olds. Also, it was found that CVPT gestures were more easily understood by both age groups when the actor conveyed information about an action, whereas when the actor conveyed information about direction, locations and spinning movement, OVPT gestures were more easily understood. This suggests that iconic gestures affect children's understanding of a speaker's message differently, depending on the viewpoints reflected in the gestures.

PB - 029 Spontaneous derivation of ad-hoc implicatures in children with autism

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Previous studies found that people with autism show intact performance on tasks that require the derivation of scalar implicatures involving the quantifier some (Chevallier et al., 2010; Pijnacker, 2009; Su & Su, 2015). Here we investigated their ability to interpret utterances relying on ad-hoc implicatures that are based on the first Maxim of Quantity. Stimuli were short animations in which a bear could come out from one of two possible containers that were differentially marked. For example, one of the containers had a drawing of a ball and a car on it while the other one had just the drawing of ball. Children listened the utterance "the bear will come out from the cup with the ball" and their anticipatory looks were recorded using a Tobii T120 eye-tracker. For the first time, we assessed this specific pragmatic ability in children with autism using a method that avoided asking explicitly any verbal or non-verbal response. Participants were 18 children with autism (mean CA = 8.9 years; mean MA = 6.7 years) and 18 typically developing children matched on mental age. We found clear evidence of implicature congruent interpretations in the anticipatory looks of both groups. These results help to extend previous findings in two ways: first, they suggest that children with ASD can derive not only scalar implicatures, but also some particularized, ad-hoc implicatures. Second, in striking contrast with their poor performance on implicit tests of false belief understanding, they can pass both explicit and implicit implicature interpretation tasks.

PB - 030 How do children assign responsibility to individuals within a team?

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We know that in simple situations even preschoolers consider individual merit (Baumard et al., 2011). However, in complex groups, identical individual performance levels can affect the group outcome in different ways, depending on the underlying causal structure of the group (Steiner, 1972). We

implemented different causal team structures within the same game (throwing balls at a target), so that differences in group structure (criteria for winning) were not confounded with other causal differences. For instance, under one rule winning depended on aggregate performance whereas under another a single specific performance level (hitting the bullseye) was necessary for a team win. Children (5.7, 7.8 years and adults, n=159) learnt one of three causal structures, presented as team game rules, and after each trial game allocated responsibility for the group outcome to each team member, whose performance varied independently of the game rule. Impressively, even the youngest group's responsibility allocations distinguished between the three causal structures, with different responsibility attributions given to identical individual performances, when these performances contributed differentially to the team outcome. This occurred even when the same performance pattern won (or lost) under all three rules, and not just when the win/loss outcome differed. Comparison with our previous study in which participants allocated reward rather than responsibility suggest that even young children distinguish meaningfully between reward and responsibility: Responsibility for the outcome is based on the group structure and team outcome, with individual performance additionally influencing the reward allocated.

PB - 031 The role of ownership history in the IKEA effect: Do children extend others as they extend themselves?

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The IKEA effect is a bias to value self-created items over identical items that are created by another. Previous work has indicated that this bias emerges at around age 5, and may be driven by developments in self-concept. In this study we tested the extended-self hypothesis by manipulating the ownership history of the items used in the task. Children first evaluated a series of toy animals made from Lego or Playdoh. They then created their own identical version of these animals using either new or used materials. Following creation, children evaluated the animals made by themselves and those made by someone else. Results revealed that children displayed an IKEA effect in all conditions of the task, valuing their own creation over an identical item created by someone else. This was the case, regardless of the ownership history of the items. This pattern of findings could indicate several interesting possibilities; the self-extension hypothesis does not account for the IKEA effect, children do not 'extend others' as they 'extend self', or children override ownership when they manipulate the materials themselves. These possibilities will be discussed in relation to current theories of social development.

PB - 032 Learning through play in preschool-aged children: the effect of reward on learning outcome

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We developed a non-verbal test of exploratory play to examine the effect of direct reward and motivation on learning. In Phase I, 47 preschool children (2 – 5 years) had the opportunity to explore a puzzle box containing a collapsible platform, and a 'set' of balls that could be inserted. Each 'set' had 5 balls of 1 colour heavy enough to collapse the platform and 5 balls of another colour that were too light. In Phase II stickers appeared on the platform. Children were encouraged to insert a second set of balls: when the heavy balls were inserted they released the sticker. In Phase III they were given a third set of balls and allowed to explore again with no stickers present, now that the potential usefulness of heavy balls had been revealed. Finally, participants had to choose which balls to collect to put into the box when stickers re-appeared, when presented pairwise from the 3 sets. All children explored at high rates throughout. At test, children chose the correct ball significantly more often than expected by chance (one-sample t-test, $t(44) = 2.65$, $p = 0.01$). There was no significant difference in performance between the three sets of balls (repeated measures ANOVA, $F(2,88) = 0.128$, $p > 0.05$). Children learned from unrewarded, unguided exploration just as well as they did from rewarded, guided exploration. The presence of a difference in causal properties/effects was sufficient to motivate learning through play, even in the absence of verbal encouragement to do so.

PB - 033 Profiling question comprehension in autism spectrum disorders

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Individuals with Autism Spectrum Disorder (ASD) have difficulties to initiate and follow a conversation. Despite the importance of asking and answering questions for social interaction, how ASD individuals comprehend the language structures involved in them has been understudied. Prosody, on the other hand, has a role in shaping questions to the point that there are languages such as Spanish where yes/no questions differ from declaratives only prosodically. As for wh questions, ASD children understand them much later than typically developing (TD) children (Goodwin et al., 2012). They are also more difficult to answer than yes/no questions (Oi, 2010; Oi and Tanaka, 2011). The difficulty in answering wh questions in ASD should be clarified since the assessment of the understanding of false-belief (Sally-Anne task) and other explicit Theory of Mind (ToM) experiments is usually made through wh questions. In this study, we examined the comprehension of wh and yes/no questions through visual and non-visual tasks, with and without false-belief content. We selected 16 high-functioning ASD children from 7 to 12 years old (mean = 10.03 years old). All of them were Spanish-Catalan bilingual with Spanish dominance. They were individually matched by verbal mental

age with a group of children in the same age range (mean= 9.79 years old). No significant differences were found between the TD and the ASD group. ASD participants performed better in Non-ToM than ToM tasks and in those with visual support. In addition, ASD participants have greater difficulties to answer wh rather than yes/no questions.

PB - 034 Audience effect in dogs

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Being watched by others has a strong effect on both human and non-human behavior. Previous studies confirm that human adults show a higher motivation to adhere to prosocial norms when they are in the presence of an observer. The aim of this study is to investigate if dogs (Canis familiaris) are sensitive to observation, and if they adjust their behavior according to the observer's familiarity. Specifically, we examined whether dogs are more likely to adhere the rules in the presence of specific observers.
In order to examine dog's behavior we used a paradigm with three experimental conditions. Two humans and the dog participated in all the three conditions. In case of two observed conditions the owner and an unfamiliar experimenter switched between an observer and a passive partner role. The third condition consisted of the mere presence condition where both humans were engaged in different activities, and were inattentive to the dog's behavior.
The results suggest that dogs are able to differentiate between potential observers and they divide their attention with a clear preference towards their owner. Surprisingly they broke the rules later in the mere presence condition compared to the observed conditions. Our results suggest that observation might have an effect not only in the control of behavior, but on the reward system as well.

PB - 035 Learning relational language in early childhood

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Children learn verbs and other relational terms such as prepositions much later compared to concrete nouns, because these terms have a less transparent semantic mapping to the perceptual-conceptual world (Gentner, 1982). In this study, we ask a) whether children's verb comprehension and prepositional comprehension relate to each other, b) how language competence is linked to their relational knowledge.
Thirty-two Turkish-learning children were tested at two time points. At Time 1, 2-year-old children (Mage=25.11, SD=1.91) were assessed for their receptive vocabulary development by TIFALDI (i.e., PPVT-4). Parents also evaluated their children's expressive language by the Turkish Communicative Development Inventory (CDI). At Time 2, the same children (Mage=35, SD=1.70) were tested for their verb and preposition comprehension. For verb comprehension task (20 trials), they pointed at the video in which the target action was shown (e.g. running vs. walking). In the preposition comprehension task, children were presented a 3D felt playground and asked to place several objects to certain locations (12 trials).
Preliminary results showed that at Time 2 children's verb comprehension correlated with their preposition comprehension ($r=.52$, $p<.01$). Children had difficulty with certain relational terms like between and next to. Preposition comprehension correlated with their relational vocabulary knowledge based on CDI score from Time 1 ($r=.44$, $p<.05$), whereas verb comprehension correlated with TIFALDI scores ($r=.53$, $p<.01$). Overall, children who were better at verb comprehension, were also more competent in prepositional knowledge. Children's previous linguistic competency and their later relational language performance can be related to each other.

PB.e - 036 Bilingual Children Show a Preference for the Mouth of A Talking Face: Analysing The Temporal Dynamics

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Previous research has shown monolingual and bilingual infants shift their attention from the eyes to the mouth of a talking face in the first year of life, putatively to help them learn the language by exploiting the redundant audiovisual cues of the mouth (Lewkowicz & Hansen-Tift, 2012; Pons, Bosch, & Lewkowicz, 2015). Interestingly, 5-year-old bilingual children also exhibit a preference for the mouth, despite the fact that they have already acquired their two languages (Birules, Bosch, Lewkowicz & Pons, 2017). The current study explored the temporal dynamics of eye gaze to a talking-face in 5-year-old Spanish-Catalan bilingual children. Participants watched three video clips of a bilingual female telling 60s-long children's stories in Catalan, Spanish and English while we recorded eye gaze with an eye tracker. We replicated our previous findings of children's preference for a talker's mouth in bilinguals, regardless of language presented, when we averaged looking time. Interestingly, however, the temporal analysis of eye gaze revealed that the strong mouth preference was only evident in the first 20s of the trial and then progressively faded into equal looking times between eyes and mouth, accompanied by an increase in shifts between the two as the story continued. These results suggest that, initially, 5-year-old bilingual children rely on mouth cues to process the speech utterance and then shift their attention to help them explore other facial cues.

PB.e - 037 New evidence for systematicity in infants' curiosity-driven learning

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Decades of research demonstrate that infants' learning is sensitive to task features. However, what level of complexity best supports learning is unclear. Moreover, infancy studies work typically employ carefully-designed experiments with complexity determined a priori. Whether infants systematically generate a particular level of difficulty during everyday, curiosity-driven exploration is therefore unknown. Twomey & Westermann's (2017) model of visual curiosity-driven learning predicted that infants will generate intermediate task complexity (cf. Kidd, Piantadosi & Aslin, 2012). Experiment 1 tests this hypothesis, while Experiment 2 extends this work to a naturalistic environment.
In Experiment 1, we developed a new shape priming paradigm. Complexity was instantiated as perceptual (color, shape) differences between a continuum of 2D exemplars. Infants were primed with peripheral exemplars, and their exploration of the remainder of the category was recorded using a screen-based eyetracker. Infants systematically directed first looks to intermediate complexity stimuli, irrespective of prime, and subsequently generated intermediate difficulty exploratory sequences. Cluster analysis demonstrated that infants exhibited one of two exploratory styles, generating either high-intermediate low-intermediate complexity sequences.
Experiment 2 extending our shape priming paradigm to a naturalistic environment using 3D-printed stimuli and head-mounted eyetracking. Stimulus edges differed in a continuum from corners to rounded. Preliminary data show a contrasting pattern of exploration to the 2D environment: after corner primes, 18-month-olds selected exemplars of greatest complexity, while after rounded primes, the infants preferred the most similar exemplars. Together, these studies offer new evidence that infants as young as 12 months actively impose structure on their learning environment.

PB - 038 Development of Expectation for Retributive Justice, or "Karma" in childhood

Akiho Yamate, Kazuhide Hashiya
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As Trivers (1971) has suggested, the evolution of altruism in social groups is regarded to be based on some psychological mechanisms of the individual. Not only direct punishment or sanction against the deviant behavior by others, expectation for such acts as a third person may also reflect the psychological mechanisms to maintain social equilibrium. The current study examined development of expectation for retributive justice, or "karma", the belief such that "happy ending goes to good persons, and the reverse (even without rational link)" in 5- to 9-year-old children and adults. We presented stories to each participant in a picture story show. Four conditions of story were prepared; Good / Bad (the main character does good/bad in 2 consecutive situations) and Lucky / Unlucky (MC experiences

lucky/unlucky in 2 consecutive situations)". After observing the 2 situations of each condition, the participant was then required to choose the ending between Happy and Unhappy. The adults (N = 47, 26 from Japan and 21 from other countries) robustly chose Unhappy ending only in Bad condition. In contrast, 5-year-olds (N = 28, Japanese) showed consistent preference for Happy ending, despite their understanding and memory of the story were sound. Further test in 6- to 9-year-olds (N = 24, Japanese) and the results of logistic regression analysis demonstrated that adult-like choice (Unhappy for the bad) appears at around the age of 7.3. Future studies should focus on cultural difference in this domain and clarify the factors to lead such developmental shift at this age.

PB - 039 Specific episodic memory based eye movement behavior among primary school children

Andrea Márta Hegedűs, Márton Nagy, Ildikó Király
Eötvös Loránd University, Hungary

The methodology of research in the field of episodic memory development was based on phenomenological experience of subjects so far. As a proposing alternative for measuring episodic memory, which could be difficult, especially in a developmental perspective, for example in preverbal age, a new research method was applied by Hannula and colleagues (2007). This task is measuring relational memory performance, which is considered to be a component of episodic memory. During the task, subjects were studying face-scene pairs, and eye movements were recorded via eye-tracker. They found a rapid preference of the matching face, emerged before responses, which they described later as an unconscious and automatic process.
We used the same task with 8-10 years old children and the goal of our study was to examine the viewing pattern in this age group and compare it to previous results, and to find out whether the matching face preference is indeed automatic and unconscious and explain the inconsistencies of developmental results in this field.
Our results showed that the relational memory performance of children this age fails to meet the performance level of adults, and their viewing pattern is not directly linked to their relational memory performance. Although, the pattern could be considered as a side effect of the decision making process of choosing the matching face.

PB - 040 Children's Explanations of Individual Behavior as a Function of Group Membership

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The Out-Group-Homogeneity-Effect describes an asymmetry in social categorization: Whereas ingroup members are readily thought of as individuals, outgroup members often are seen as homogeneous exemplars of their group. In two studies in Israel and Germany, we investigate children's causal reasoning as a function of group membership: Do children explain the behavior of outgroup members more often by reference to group membership, compared to the behavior of ingroup members?
In Israel, 26 kindergarteners (Mage = 5.5, range = 4.4 – 6.4) and 25 grade schoolers (Mage = 7.8, range = 6.6-8.5) were presented with three trials about ingroup ("Jews"), and three about outgroup members ("Arabs"). In each trial, four members of the given group were introduced successively, all engaged in the same activity. Thus, each trial established a (fictitious) group norm. Children then were asked to explain the behavior of the fourth individual. Answers were coded as either group or individual explanations, or irrelevant answers, then summed up.
The main finding was an interaction between group membership and explanation type, $F(1,49)=7.37$, $p=.01$: children used group explanations more often for outgroup as compared to ingroup members, and more individual explanations for ingroup as compared to outgroup members. These findings reveal the early emergence of intergroup biases in the explanation of people's behaviors. To assess the generalizability of these biases, a replication study in Germany currently is being conducted. Samples and testing procedure correspond to those outlined above, only the groups in question differ, with "Germans" serving as ingroup and "Turks" as outgroup.

PB - 041 Action kinematics at 10 months are associated with later social abilities at 14 months in infants at high and low risk for developing autism

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University of London, UK

The kinematic qualities of our actions send important social signals to our interaction partners, such as expressing our affective or mental state. Adults with Autism Spectrum Disorders (autism) have previously been shown to produce actions with atypical kinematics – i.e., increased jerk – relative to typical adults. Therefore it has been hypothesised that some of the social and communication difficulties between individuals with autism and typical individuals can be explained by differences in how actions are produced, such that these two populations cannot correctly understand the others' kinematic cues about internal states. To inform the potential contributory role of action kinematics to atypical development in autism it is important to ask whether differences in movement kinematics can be identified early in development. The current study measured the jerk of movements of 10-month-old infants with either a high or low familial risk of developing autism during a 'free-play' session and related it to later social skills, measured at 14-months-old. Contrary to the findings in adults, infants who made movements that were less jerky had more atypical social skills later in development. Although this pattern is opposite to that predicted based on the adult literature, it is in line with recent models about how motor variability relates to motor learning. Importantly, it also suggests that early differences in movement kinematics may indeed relate to the development of early social skills, and that movement kinematics could represent a good candidate biomarker for social disorder.

PB - 042 Lexical memory traces in mono- and bilingual toddlers: an ERP study

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It has been recently shown that brain response dynamics change during repetition of novel lexical items: As adult participants get familiarized with novel lexical forms, the magnitude of fronto-centrally distributed activity increases and becomes similar to that of known words (Shtyrov, 2011). The same effect has been shown to occur more rapidly in school-aged children, probably due to greater brain plasticity (Partanen et al., 2017). In our study, we investigated brain activity in response to known, unknown (pseudo) and illegal French words in 24-month-old mono- and bilingual children. Children were presented with a passive listening task during which they were exposed to four known (ballon, bateau, cheveux, maison), pseudo (bonsa, lechon, meautai, vabeux) and illegal (bmeausai, chbeula, vchonbe, zbaiton) words, each repeated for 60 times. Continuous EEG responses were recorded throughout the experiment, and the ERPs were averaged according to the word type and phase of the experiment (early, middle, late). The results showed that monolingual children presented a greater positive response to known words compared to pseudo-words over the left frontal sites during the early phase of the experiment. This difference between the real and pseudo words disappeared during the later phase suggesting that brain dynamics go through changes during word familiarization in monolingual children. In contrast, bilingual children did not exhibit a difference in brain responses between known and unknown words, which may suggest that children exposed to dual languages during their early language acquisition are less tuned to specific word forms.

PB - 043 Turkish-speaking children's tracking of informational access: Comprehension of evidentiality marking

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Children often rely on others to learn about the world. In learning from others, speaker's informational access is a critical cue to evaluate the reliability of the testimony. Recent studies have focused on how young children evaluate the relative evidential strength of statements (first-hand observation vs. hearsay). However, most of these studies are conducted in English, in which marking of evidentiality is optional, unlike languages like Turkish in which it is obligatory. As part of a larger cross-linguistic project, the present study aims to investigate whether 5- and 6-year-old Turkish-speaking children would have an advantage over English-speaking children of the same age due this structural difference between the two languages.
Broadly mimicking selective learning paradigms, we used a procedure that consists of presenting children with a novel animal with unique characteristics (e.g., eating rocks). Children heard two informants in a video-clip who conveyed conflicting information about what the animal needs (e.g., one conveyed that it eats rocks, the other sand). Critically, one informant reported a first-hand observation; the other hearsay. We analyzed whether children selected the items supported by the first-hand report. The findings revealed that 5-year-old Turkish-speaking children performed at chance in differentiating between the information sources. Data collection with older age groups and English-speaking children are in progress. The implications of the results for theoretical discussions of the interface between conceptual and linguistic development will be discussed.

PB - 044 Pretend play and narrative creation

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Children who pretend play (e.g. having an imaginary companion) use more complex linguistic structures such as subordinating conjunctions (e.g. 'when','because'), relative clauses or coordinated clauses (e.g. 'and','but') (Bouldin, Bavin, & Pratt, 2002). In this study, we ask whether children, who engage in pretend play more, display more advanced language (i.e., using complex linguistic structures) during narrative creation.
One-hundred-and-nine Turkish children (58 girls; Mage=45.82 months, SD=6.01) participated in the study. Children were administered two different narrative creation tasks - Birthday and Magical Key (Mottweiler & Taylor, 2014). Children continued building the narrative after an experimenter provided the story to a designated point. The former story was used as a warm-up and the latter provided more space for narrative creation. Last, the telephone task assessed children's ability to engage with an imaginary social partner as a measure of pretense. Both stories were coded for linguistic

complexity narrated by the participants. The total number of utterances, complex clauses (clauses that were adverbial), and simple clauses were calculated as an indication of language competence. There was a correlation between telephone pretense score and linguistic variables of the Magical Key story, after controlling for age. Telephone score was correlated with the total number of utterances, $r(82)=.26$, $p<.05$, the total number of clauses $r(82)=.24$, $p<.05$, and complex clauses $r(82)=.32$, $p<.01$. These findings suggest that children, who engage in pretend play more, provide linguistically more developed narrative.

PB - 045 Influence of arguments on advice-taking in 4 to 6 year old children

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Children have to acquire extensive knowledge, most of it by testimony of others. To avoid being deceived children use multiple cues to assess the value of testimony (König & Harris, 2005). However, testimony often comes accompanied by arguments to increase persuasiveness. Developmental research has shown that children are affected by arguments and provide arguments of their own (Perlman & Ross, 2005). But little is known on how children understand and evaluate the epistemic quality of arguments.
In the current study we adapted for children a method used by social psychologist, the "judge-advisor system" (JAS; Sniezek & Buckley, 1995). In a JAS, a judge can adjust an initial judgment after getting an advice. We presented 4- to 6-year-olds (n=40) with a visual perception task differing in difficulty depending on whether one had good or poor visual access. There were two conditions: (1) the child was better informed, and (2) the advisor was better informed. The advice was given accompanied by an argument. Depending on condition the argument was compatible or conflicted with the advisor's visual information and was thus, of high or low epistemic quality.
Results revealed that children are sensitive to arguments and take more advice when accompanied by arguments. But the rationality of this sensitivity is limited, since children are insensitive to argument quality (children did not differentiate between arguments of high and low epistemic quality). Whether this reflects limited metarepresentational skills required to understand the epistemic value of arguments is currently being investigated in follow-up studies.

PB - 046 The influence of language and other background variables on mathematics achievement in Luxembourgish students

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Cross-linguistic studies show that language affects numerical cognition and subsequent mathematical learning. Analysing the language impact on mathematics is highly relevant in a multilingual learning

context with altering instruction languages and multiple home languages. In such a setting, these linguistic influences need to be disentangled from mathematical processes within word problems to provide a fair(er) evaluation of students' mathematical skills. In Luxembourg, the teaching language for mathematics changes from German in primary school to French in secondary education. Prior research shows that the inverse structure of two digit number words in German (unit-decade) and in French (decade-unit) impacts students' arithmetic skills and that students' mathematics achievement depends on their language proficiency in the test language. Naturally, at the level of word problems, data from large-scale studies (e.g. PISA) show that students' reading comprehension competency in the test language influences their mathematics score. Moreover, both reading and mathematics competencies are highly influenced by students' home language.
In previous analyses (e.g. PISA), students had to choose the test language at the start of the test. However, in this study, we will analyse grade 9 students' mathematics performance in relation to their reading comprehension skills (in both German and French) and their linguistic background in a test in which students could choose and continuously switch between test languages (German and French). Data are taken from the national school monitoring and analysed to identify predictors for mathematics achievement.

PB.e - 047 How great apes adjust their pointing behavior to the physical and social context

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We review three experiments with great apes on their ability to modify their default pointing behavior used for food request in order to informatively indicate a high quality food item which is 1) behind a transparent barrier, 2) placed further away behind a low quality food item and 3) accessible only for an ignorant addressee. Our results suggest that apes successfully adjust their pointing behavior to the physical configuration of the environment (including food distance and location). In order to indicate a high quality food item that was further away (e.g. behind a barrier or behind a low quality food), apes were able not to move their hand as close as possible to the food item (which would have led to an ambiguous request, potentially indicating the low quality item). Instead, apes pointed from the side or pointed from behind a transparent barrier in some trials, presumably to indicate that they want the food item which was further away. However, we found no evidence that the knowledge of the addressee modulates their pointing behavior. This implies that great apes' pointing is a more flexible tool to communicate than ritualized reaching, but less versatile than pointing in humans.

PB - 048 Representing the presence and the absence of an object in domestic chicks – A violation of expectation paradigm

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While there is a rich literature on how humans and nonhumans encode the presence of objects, encoding abstract representations of absence are largely unexplored. Previous research on pre-linguistic infants showed an asymmetry between these two cognitive abilities. While infants form expectations about the presence of objects, they do not seem to form such expectation about the absence objects (Wynn & Chiang, 1998). We adapted the looking-time paradigm used in infant research to test whether 8-day-old domestic chicks show similar asymmetries.
We found that chicks show sensitivity for violations regarding both the object's presence and absence. However, their responses were different concerning our measurements. Regarding encoding presence, chicks – just like human infants – looked longer when the object unexpectedly disappeared compared to an expected disappearance. Similarly to infants, chicks did not show longer looking time in experiments testing encoding absence. However, in three experiments investigating the representation of absence, they showed a sex dependent bias in left-eye usage towards the unexpectedly appearing object. As the object was the same in all outcomes, the different eye usage must reflect how chicks identify an object based on tracking its presence and absence. Given this eye usage bias, the asymmetry in looking-time pattern should not be considered as a proof of pre- and non-linguistic creatures' representational asymmetry concerning absence and presence. Our results are in line with former research revealing chicks' remarkable capacities to represent the presence of objects and importantly, we documented non-linguistic creatures' ability to spontaneously represent the absence of objects.

PB - 049 Preschool children reason about artist mental states when naming drawings

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This research investigated whether there is a connection between children's understanding of simple ambiguous drawings and understanding of two mental states, namely knowledge state and belief. To examine whether children take into account an artist's intent and their mental state when interpreting the drawing, we presented 3 to 5-year-old children with two interactive stories where they had to track a) a character's knowledge state or b) character's belief. Characters produced a drawing

which reflected their mental state (e.g., b) drawing the expected contents of a deceptive box while holding a false belief). We compared children's performance on both tasks – naming the character's drawing, and answering an explicit question about the character's mental state. In addition, we tested children with an unexpected contents task to compare the two newly designed drawing tasks to an established measure of false-belief understanding. Children were equally successful on both drawing and explicit mental state tasks, suggesting that false belief understanding and interpreting drawings based on mental states require understanding of mental representations in general.

PB - 050 Evidence For Continuity in Relational Reasoning Across Species and Development

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Relational Match to Sample (RMTS) is a common test of relational reasoning involving matching one of two sample cards to a target card based on the relations "same" and "different". Previous literature has suggested difference between the populations who fail RMTS (children under five, non-human animals) and those who succeed (human adults) is due to discontinuities between these populations in A) representations of "same" and "different" and/or B) executive function (EF) capacities.
Recent work has shown spontaneous relational matching in non-human animals (crows) after pre-training on a series of non-relational matching tasks. Experiment 1 replicated these results in children: Four-year-olds spontaneously succeed on RMTS after pre-training on tasks from this paradigm.
Experiment 2 tested the effects of pre-training tasks from Experiment 1 on the performance of adults on a modified RMTS task. If, in line with discontinuity theories, the difference between success and failure on RMTS (and thus the effect of pre-training in Experiment 1) is a change in representation or EF, pre-training should not affect adult performance given adults already have the representations "same"/"different" and mature EF. In contrast, adults were significantly more likely to make spontaneous relational matches after non-relational pre-training.
Thus, inconsistently with discontinuity accounts, the same pre-training which allows young children and non-human animals to succeed on RMTS also increases relational matching in adults. This work begins to explore the mechanisms involved in relational reasoning which may exhibit such continuity.

PB - 051 Reactive aggression and strategic behavior in the prisoner's dilemma game

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Reactive aggression refers to excessive negative responses to perceived threats or provocations

(Crick & Dodge, 1996; Kempes et al. 2005). Research on reactive aggression typically uses hypothetical scenarios and parent report measures, but safe, real-time measures of aggressive interactions are needed to investigate the mechanisms of these behaviors. In this study, we used a Repeated Prisoner's Dilemma (RPD) game with pre-programmed partners designed to elicit aggressive responses. Children interacted with each partner over ten rounds and simultaneously decided either to cooperate or defect, resulting in different payoffs based on the combined decision. Participants were a community sample of 153 children between the ages of 9 and 11. Parent ratings of reactive aggression were obtained (PRPA; Kempes et al., 2006) and a median split used to identify high (n = 58) and low aggression groups (n = 95).
Several signatures of reactive aggression in RPD play emerged. Children high in reactive aggression were less likely to cooperate compared to children low in reactive aggression (p=0.01). They were also more likely to engage in repeated defections with a Tit-for-Tat partner (p=0.03) and to continue defecting following partner's return to cooperation (p=0.01). These findings suggest that the RPD game can successfully be used as a measure of interpersonal engagement and allows for systematic investigations of behavioral and, in the future, neuro-cognitive mechanisms that lead to reactive aggressive interactions.

PB - 052 How do children treat information from an unreliable source?

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Preschoolers selectively learn from previously reliable over unreliable informants when both offer contradicting information. But when an unreliable informant offers uncontested information children will also learn from her. So are children really only selective when first encountering novel information and once acquired, all information is treated the same, regardless of its source? Or is information form unreliable sources tagged as such and, at least initially, treated differently (e.g., not used as a base for further inferences)?
To explore this, 5-year-olds witnessed a reliable and an unreliable female speaker provide either compatible or contradictory novel information (between-subject). Each speaker referred to a different member of a pair of novel objects using either the same label (contradictory condition) or a different label (compatible condition). Then in a disambiguation task, children saw those same two objects and heard a male voice use a completely new label to refer to one of them. We expected children to choose the object previously labelled by the unreliable speaker, especially in the contradictory condition. If children keep track of the reliability of the source even in case of uncontested information, they should also do so in the compatible condition, otherwise they should act at random.
Data collection is ongoing, but preliminary results suggest that children (N=36) selectively chose the object previously labelled by the unreliable speaker, with no significance difference between conditions. These preliminary results suggest that children retain information about the reliability of a source, even when an unreliable source offers compatible information.

POSTER SESSION B
FRIDAY

PB - 053 3- and 4-year-old children spontaneously use two tools in combination (Associative tool use) to solve diverse tool-use problems

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Associative tool use (ATU) describes the use of two or more tools in any combination. For example, two tools can be used in sequence to act on a target item (Tool set), a tool can be used to improve the function of another tool (Metatool use) or to obtain another tool (Sequential tool use). Studies on young children's problem-solving have investigated children's capacity to use and/or innovate simple tools, but research on children's associative tool use has remained sparse. The study we present here is the first to investigate 3 types of ATU (see above) in children to explore whether young children can solve these tool-use problems individually (yes/no), i.e., without social learning. We designed 6 tasks (2 for each ATU type), which were partly inspired by the existing literature, partly novel, and presented them to 66 3- and 4-year-old children in the UK (each child received 3 tasks, one for each ATU type). Children succeeded in all three types of ATU individually, suggesting that children can innovate relatively complex forms of tool use without social learning. Success rates were low, suggesting that for young children ATU is challenging (but not impossible).This study adds to the literature new insights into which tool-use behaviours children can discover unaided as well as several new tool-use tasks which can be used to study problem-solving and causal reasoning and their underlying cognitive mechanisms (e.g., executive functions) in young children.

PB.e - 054 The two routes to become a leader: Dominance vs. Prestige

Jesús Bas, Núria Sebastián-Gallés
Universitat Pompeu Fabra, Spain

Infants represent leader-follower relationships at very early stages of development (Bas, J. et al, in prep.). However, what intuitions do infants have about who should be the leader?
There are two different ways of assigning social status to agents in a group: dominance and prestige. It has been shown that infants understand both systems (Bas, J. & Sebastián-Gallés, N., under review; Mascaro, O. & Csibra, G., 2012). Given that social status drives concepts of leadership, here we compare whether being the dominant agent or the prestigious agent helps infants predict the emergence of the leader role.
We recorded 18-month-olds' eye gaze as they watched short animations, in which one observer agent watches another two agents successfully pick up a ball individually. However, when these two agents both want to pick it up at the same time, only one of them prevails (always the same agent). Critically we manipulated how the winner prevailed, through communication (prestige) or using force (dominance). After this familiarization, the observer agent chooses to follow one of the other agents - either the "winner" or "loser" of the ball task.

We measured infants' anticipation preceding the observer agent's choice of who to follow, and the total looking time after the observer agent makes its decision. Preliminary analyses using both measures indicate that infants expect the observer to select as a leader the prestigious winner. Data collection for the dominant winner is still under way, however preliminary data do not point the same direction

PB - 055 Spatiotemporal vs Conceptual object individuation

Gábor Bródy, Gergely Csibra
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Already in infancy we can individuate and recognize objects based on both conceptual properties and on spatiotemporal information. The current research aims at exploring the relationship of these two individuation processes in the first year of development. We hypothesize that spatiotemporally individuated object representations and purely conceptual object representations show a double-dissociation pattern. To represent objects, infants – at least 10-month-olds – either use one or the other individuation system, but not both. To test this hypothesis, we used the manual search individuation paradigm developed by Van de Walle et al. (2000). After replicating their original finding without naming the objects, in 2 followup studies we either labelled the two spatiotemporally distinct objects with same or different labels to enhance conceptual encoding. We found evidence for object individuation only when the objects were not labelled. This was significantly different from the condition where objects were labelled with the same label, where infants seemingly did not individuate objects. In the different label study infants did not individuate objects either.

PB - 056 Do non-human great apes show susceptibility to others' beliefs in a manual search task?

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Recently in an eye-tracking paradigm Krupenye et al (2017) demonstrated the first time that non-human great apes, much like human infants, anticipate other's actions based on their respective beliefs. However, humans were argued to have better socio-cognitive skills (Herrmann et al, 2007) than other apes; thus it is possible that even if non-human apes share some aspects of Theory of Mind (ToM), they may not share all of the ToM-related cognitive phenomena found in human infants and adults. Previous research suggests that infants' behavior can be modulated by another agent's belief (Kovács et al, 2010). Relatedly, 14-month-old infants were found to search longer if another person believed an object to be present in a box, even though infants knew the box was empty (Kampis & Kovács, in prep.).
In the present study we test whether non-human great apes' search behavior is also modulated

by another person's beliefs. First, apes' tracking of 1 or 2 objects is assessed (baseline trials) in a manual search task (following Mendes et al, 2008). Then apes witness another person participating in the same task (mock-baseline). Finally, following Kampis & Kovács (in prep.), in belief trials we create scenarios where apes can know that nothing remains to search for, which is known by the other person in true belief trials; but she falsely believes something to remain in false belief trials. A difference in apes' search in true and false belief trials would indicate a modulation by the other's belief. Data collection will finish November 2017.

PB - 057 The Role of Native Speaker Preference on Infants' Learning of Novel Tunes

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Recent evidence suggests that infants exhibit increased attention to stimuli after listening to a native speaker's speech (Begus, Gliga, & Southgate, 2016; Marno et al., 2016). These findings have been interpreted as early attentional biases for native speakers (Kinzler, Dupoux, & Spelke, 2007) reflecting infants' preference for potential sources of information. However, the question of whether early social biases lead to better learning of new information remains unclear. This study aimed to ask whether infants' selective listening to novel tunes introduced by native speakers (Soley & Sebastián-Gallés, 2015) also extends to better learning of those tunes.

To answer this question, three experiments were conducted (n = 16 per experiment) with 7-10 months old infants. Using a habituation paradigm, Experiment 1 showed that infants cannot readily discriminate two novel tunes, when the second tune is a slightly modified version of the original tune. Accordingly, in the next experiments infants were initially familiarized with the original tune that was either introduced by a native speaker (Experiment 2) or a foreign speaker (Experiment 3). After this brief familiarization phase, infants' discrimination of the original tune from its modified version was measured using a habituation paradigm. While some learning happened in both conditions, results show that infants could discriminate the two tunes in the native language condition, but not in the foreign language condition.

These findings suggest that early attentional biases might have important ramifications for young infants and that infants might more readily acquire information when it is introduced by native speakers.

PB - 058 Infants' perception of multi-person scenarios

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CNRS, France

We address the hypothesis that there are specialized mechanisms for the visual perception of social interactions, which may be crucial to trigger higher-level inferential processing for (social) action understanding. Recent results demonstrate that the adults' visual system show sensitivity to dyads of interacting human bodies. For instance, bodies facing each other are recognized better and faster than nonfacing bodies. With a preferential looking paradigm, we asked whether the facing/nonfacing positioning already influences 6-month-olds' perception of dyads of bodies. In each of 16 trials, two body postures were selected. On one half of the screen, the two postures were presented facing each other; on the other half, they were presented back to back. The side where the facing dyad appeared was randomized across trials. Each trial lasted 5 seconds. Infants (N=16) looked on average longer at facing-away dyads. A control experiment found that this effect was disrupted when dyads were presented upside-down, ruling out that the previous effect was carried by low-level properties of the images. Rather, 6-month-olds appear to be already sensitive to the relative positioning of bodies in space. Contrary to our initial expectations, however, they looked longer at facing-away dyads, not facing dyads. Possibly, this effect is due to facing dyads being processed faster than nonfacing dyads. Additional experiments are being run to test this hypothesis.

POSTER SESSION C
SATURDAY

PC - 001 The short-term effects of elementary school music education on the development of musical, linguistic and intellectual abilities

Borbála Lukács[1], Ferenc Honbolygó[1,2]

[1]Eötvös Loránd University, Hungary, [2]Hungarian Academy of Sciences, Hungary

PC - 002 The illusion of predictability: Behavioural predictions favour collaboration?

Zsófia Esperger, Melinda Friesenhahn, Luca Kozma, Ferenc Kocsor, Tamás Tényi, Róbert Herold

University of Pécs, Hungary

PC - 003 The impact of the Socioeconomic status (SES) on infants' spontaneous speech

Camila Scaff, Alejandrina Cristia

École Normale Supérieure, France

PC - 004 Development of timing of turn-taking from adolescence to adulthood

Lilla Magyari, Ilona Kovács

Pázmány Péter Catholic University, Budapest

PC - 005 Physically performing actions enhances memory for verb sequences in children

Angie Makri, Chris Jarrold

University of Bristol, UK

PC - 006 Infants' encoding of location and appearance of pointed-at and reached-for objects, when both appearance and location are relevant

Mikołaj Hernik[1], Dan Sperber[1,2], György Gergely[1]

[1]Central European University, Budapest, Hungary

[2]Institute Jean Nicod, Paris, France

PC - 007 Mobile device usage is associated with cognitive skills in preschool children

Veronika Konok[1], Bence Ferdinandy[2], Zsófia Ágnes Réti[1], Nóra Bunford[1,3], Ádám Miklósi[1,2]

[1]Eötvös Loránd University, Hungary, [2]MTA-ELTE Comparative Ethology Research Group, Hungary;

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PC - 008 Is ascribing false beliefs less difficult than considering them to ascribe intentions?

Britta Schünemann, Marina Proft, Hannes Rakoczy

Georg-August-University, Germany

PC - 009 Correlates of Pretend Play in a Non-western Preschool Sample

Deniz Tahiroglu

Bogazici University, Turkey, Ozyegin University, Turkey

PC - 010 Joint engagement influences 10-month-olds looking at object during word learning

Eugenia Wildt

Paderborn University, Germany

PC.e - 011 Joint goal representation in infants: a fNIRS study

Katarina Begus, Arianna Curioni, György Gergely, Guenther Knoblich

Central European University, Hungary

PC.e - 012 Spatial indexing in false-belief tasks: A continuous eye-tracking study

Paula Rubio-Fernandez

Massachusetts Institute of Technology, USA

PC - 013 Children's Sensitivity to Water and Food Contamination in Tanzania, East Africa

Mary Gauvain[1], Heidi McLaughlin[2]

[1]University of California Riverside, USA, [2]Pacific Lutheran University, USA

PC - 014 Young children's gestures reveal the core properties of language: the effects of spatial coherence and the establishment of common ground

Zanna Clay, Chloe Smith

Durham University, UK

PC - 015 Reputation management and egalitarianism in 5-7 year-olds of two cultures

Erin Robbins

University of St Andrews, UK

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PC - 016 Critical thinking at school: flexible reasoning in word problem solving

Calliste Scheibling-Sève[1],[2], Elena Pasquinneli[2], David Sander[3]

[1]University Paris [8], France, [2]La main à la pâte Foundation, France, [3]University of Geneva, Switzerland

PC - 017 When do children appreciate doing the right thing for the right reason?

Marina Proft, Jan Engelmann, Michael Tomasello

Max Planck Institute for Evolutionary Anthropology, Germany

PC - 018 Even indirect communication influences infants' expectations about others' belief-based actions

Cornelia Schulze[1], David Buttelmann[2]

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PC - 019 Young children's preferences for ingroup and outgroup members

Jonas Hermes[1], Marie Lammel[1], Laura Böttcher[1], Tanya Behne[1], Gil Diesendruck[2], Hannes Rakoczy[1]

[1]University of Göttingen, Germany, [2]Bar Ilan University, Israel

PC.e - 020 Effects of games on sharing and social inclusion in preschoolers

Theo Toppe[1], Susanne Hardecker[2], Daniel Haun[1]

[1]University of Leipzig, Germany, [2]Max Planck Institute for Evolutionary Anthropology, Germany

PC - 021 Representational momentum in displacement tasks: Relative object weight matters in toddlers' search behaviour

Michael Hast

St Mary's University Twickenham, UK

PC - 022 Generic Information Supports the Fast-Mapping of Novel Labels

Cristina I. Galusca[1], Krisztina Andrási[2], Gergely Csibra[2]

[1]Universitat Pompeu Fabra, Spain, [2]Central European University, Hungary

PC.e - 023 Pedagogical cues and action complexity modulate transmission of information in two-years-old children

Marina Bazhydai, Priya Silverstein, Gert Westermann, Eugenio Parise

Lancaster University, UK

PC - 024 Motherese and motionese combine forces: Evidence for multi-modal learning in infants

Marlene Meyer[1], Johanna E van Schaik[2], Melanie S Schreiner[3], Jelena Sucevic[4], Sabine Hunnius[5]

[1]University of Chicago, USA, [2]Leiden University, Netherlands, [3]University of Goettingen, Germany, [4]University of Oxford, UK, [5]Donders Institute, Radboud University Nijmegen, Netherlands

PC - 025 Learning to Deceive has Cognitive Benefit

Xiao Pan Ding[1], Gail Heyman[2], Liyang Sai[3], Piotr Winkielman[2], Genyue Fu[3], Kang Lee[4]

[1]National University of Singapore, Singapore, [2]University of California San Diego, USA, [3]Hangzhou Normal University, China, [4]University of Toronto, Canada

PC - 026 Developmental aspects of electrodermal activity

Bianka Gönye, Anna Szekely

Eötvös Loránd University, Hungary

PC.e - 027 Do young infants have an attentional preference for social interactions?

Maleen Thiele, Robert Hepach, Daniel Haun

Leipzig University, Germany

PC.e - 028 Four-year-old Children Selectively Imitate the Other's "Intentional" Action with Taking Interjection as a Cue

Yusuke Uto, Kazuhide Hashiya

Kyushu University, Japan

PC - 029 Influence and Preference in Development: How others' product evaluations affect children's decisions about value

Lauren Marsh[1],[2], Bruce Hood[2]

[1] University of Nottingham, UK, [2]University of Bristol, UK

PC - 030 Does Bilingualism Modulate Children's Beliefs on the Origin and Stability of Language and Physical Traits?

Joan Birules[1], Carlota Saumell[1], Laura Bosch[1], Krista Byers-Heinlein[2], Ferran Pons[1]

[1]Universitat de Barcelona, Spain; [2]Concordia University, Canada

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PC - 031 Concept combination is difficult, even if you have the constituent concepts at your disposal

Zoltan Jakab[1], Szabolcs Kiss[2]

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PC - 032 Exploring the impact of maternal speech on 7.5-month-olds' segmentation abilities

Melanie Steffi Schreiner, Nivedita Mani

Goettingen University, Germany

PC - 033 Acquiring a proper name via the speaker's false belief

Gala Stojnic, Alan M. Leslie

Rutgers, The State University of New Jersey, USA

PC - 034 Implicit and explicit sequence learning in Tourette syndrome

Eszter Tóth-Fáber[1], Zsanett Tárnok[2], Andrea Kóbor[3], Karolina Janacsek[1,4], Alexandra Rádosi[1], Eszter Dóra Szabó[1], Dóra Merkl[2], Szabina Oláh[2], Orsolya Hegedűs[2], Péter Nagy[2], Réka Vidomusz[2], Dezső Németh[1,4], Ádám Takács[1]

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PC - 035 The acquisition of agglutinating morphology in Hungarian infants

Eniko Ladanyi, Judit Gervain

Universite Paris Descartes, France

PC.e - 036 How do infants encode unexpected events? Visually evoked neuronal rhythms may tell!

Moritz Köster[1], Miriam Langeloh[2,3], Stefanie Hoehl[2,4]

[1]Freie Universität Berlin, Germany, [2]Max Planck Institute for Human Cognitive and Brain Sciences, Germany, [3]Heidelberg University, Germany, [4]University of Vienna, Austria

PC.e - 037 How efficient are the beliefs about efficiency? The case of 3-year-olds in a tool use task

Paula Fischer, Ágens Melinda Kovács, Ernő Téglás

Central European University, Hungary

PC - 038 Do children represent the future as in front of them?

Patrick Burns[1], Agnieszka Jaroslawska[2], Áine Fitzpatrick[1], Eugene Caruso[3], Teres McCormack[1]

[1] Queen's University Belfast, UK, [2] University of Edinburgh, UK, [3] University of Chicago, USA

PC - 039 The ontogeny of social touch: 9-month-olds' heart rate response to tactile stimulation varies depending on who they think is touching them

Marie Aguirre, Auriane Couderc, Justine Epinat-Duclos, Olivier Mascaro

Institut des Sciences Cognitives Marc Jeannerod, CNRS, France

PC - 040 The ontogeny of tool innovation: Cognitive, social, and cultural processes

Gökhan Gönül[1], Annette Hohenberger[1], Michael Corballis[2], Annette M. E. Henderson[2]

[1]Graduate School of Informatics, Turkey, [2]School of Psychology, New Zealand

PC - 041 The relationship between monitoring in executive functions and metacognition

Qendresa Thaqi, Claudia Roebers

University of Bern, Switzerland

PC - 042 Beyond the Literal: Six-year-olds' flexible interpretations of pictures

Romina A. Vivaldi[1], Melissa L. Allen[2]

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PC - 043 The influence of normative expectations on German and Indian children's prosocial behavior

Süheyla Yilmaz[1], Bailey House[2], Patricia Kanngiesser[1], Joan Silk[2]

[1]Freie Universität Berlin, Germany, [2]Arizona State University, USA

PC - 044 Development of pre-decisional information search and choice behavior in a complex probabilistic decision environment

Anne Lehmann, Tilmann Betsch

University of Erfurt, Germany

PC - 045 The role of communication in guiding infants' social inferences

Marc Colomer, Nuria Sebastian-Galles

Universitat Pompeu Fabra, Spain

PC - 046 Sense of body ownership in infancy

Beatrix Lábadi

University of Pécs, Hungary

PC - 047 Do 12-month-olds use the principle of compositionality to interpret complex noun phrases?

Barbara Pomiechowska, Gábor Bródy, Ernő Téglás, Ágnes Melinda Kovács

Central European University, Hungary

PC - 048 Promoting toddlers' social cognition and prosocial behavior: a training study at nursery

Elisa Brazzelli, Ilaria Grazzani

University of Milano-Bicocca, Italy

PC.e - 049 Preverbal logic at work: logical reasoning supports infants' processing of others' preferences.

Nicoló Cesana-Arlotti, Ágnes Melinda Kovács, Ernő Téglás

Central European University, Budapest, Hungary

PC - 050 Preschooler's information search and planning in a maze exploration task

Nora Swaboda, Björn Meder, Azzurra Ruggeri

Max Planck Institute for Human Development, Germany

PC - 051 14-month-old human infants' understanding of others' false beliefs involving numerical identity mistakes

Dora Kampis[1], Ildikó Király[1,2], Josep Call[3], György Gergely[1]

[1]Central European University, Hungary, [2]Eötvös Loránd University, Hungary, [3]University of St Andrews, UK

PC - 052 The influence of social context features in social referencing – Conceptual accounts and a study idea

Samantha Ehli, Babett Voigt, Albert Newen, Silvia Schneider

Ruhr-University Bochum, Germany

PC - 053 Do children see angles and distances as different things?

Véronique Izard[1], Marianne Duyck[1], François Meyer[1], Lucie Martin[1], Mélanie Brun[1], Philippine Courtier[1,2]

[1]CNRS Université Paris Descartes, France, [2]CNRS and Université Claude Bernard Lyon, France

PC.e - 054 Infants understand helping as reducing the cost of the helpee's action

Laura Schlingloff, Denis Tatone, Barbara Pomiechowska, Gergely Csibra

Central European University, Budapest, Hungary

PC - 055 What narratives tell us about language in autism spectrum conditions

Kristen Schroeder[1,2], Miriam Garcia[1,2], Joana Rosselló[1,2], Wolfram Hinzen[1,3]

[1]GracLab, Barcelona, Spain, [2]Universitat de Barcelona, Spain, [3]Universitat Pompeu Fabra, Spain

PC - 056 Normative learning of tool and non-tool actions

Angelique Eydam, Erika Nurmsoo

University of Kent, UK

PC - 057 Effects of adult-child interaction processes on learning and memory

Karsten Manske[1], Frauke Hildebrandt[2], Werner Sommer[3], Andrea Hildebrandt[4], Julia Festman[5]

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PC - 001 The short-term effects of elementary school music education on the development of musical, linguistic and intellectual abilities

Borbála Lukács[1], Ferenc Honbolygó[1,2]
[1] Eötvös Loránd University, Hungary, [2] Hungarian Academy of Sciences, Hungary

Although several studies have proved the positive impacts of out-of-school music training on basic cognitive and linguistic abilities, only a few music interventions have examined the possible benefits of music education in school contexts. In the present study, we aimed to investigate the behavioural transfer effects of a movement-based music education program in first-grade elementary school children. Assessments were carried out at the beginning and at the end of the first school year in order to evaluate the development of music perception, linguistic and intellectual abilities after 6 months of music education. We compared two groups of first-year students participating in the special music instruction: children were either attended to the class with an intensive music curriculum or the class with a mathematics curriculum in the same elementary school. Results showed significant improvements both in music, language and IQ at the end of the school year. Although performance did not vary in the two classes, associations between specific musical auditory skills and language-related abilities were stronger in the music class compared to the class with the mathematics curriculum. These results indicate that short-term active engagement in musical activities in a school context may enhance the connection between the music and language domain.

PC - 002 The illusion of predictability: Behavioural predictions favour collaboration?

Zsófia Esperger, Melinda Friesenhahn, Luca Kozma, Ferenc Kocsor, Tamás Tényi, Róbert Herold
University of Pécs, Hungary

Monitoring others' beliefs intertwines with monitoring intentions and producing behavioural predictions. We were curious about whether taking this system apart during operation can reveal more about its nature. In the present study we have investigated whether monitoring others' beliefs – without any representation about their intentions – leads to behavioural probability predictions. Adult participants watched videos in which either 1) the participant 2) another agent 3) both of them or 4) neither of them held the belief that an object was present behind a screen. At the end of each video, the agent could be seen while the screen still covered the presence or the absence of the ball. Here we froze the videos and asked our participants how probable they thought it was that the agent would reach towards the screen. In two studies we applied 'prepared' vs. 'intuitive' instructions. Participants consciously calculated their behavioural predictions from the beginning of, or right after, the video stimulus respectively. We show that shared beliefs – but not the other agent's (false) beliefs– predict that he will reach towards the screen. This effect is more pronounced when participants have to give intuitive predictions. Our findings suggest that shared beliefs create the illusion of behavioural predictability. This illusion may favour collaboration because predictability

linked with shared beliefs (rather than diverse beliefs) underpins joint action. Further investigation should strengthen these assumptions, requiring spontaneous rather than elicited responses.

PC - 003 The impact of the Socioeconomic status (SES) on infants' spontaneous speech

Camila Scaff, Alejandrina Cristia
École Normale Supérieure, France

Scientific community has underlined variations in language acquisition patterns. One of the main aim among researchers is the study of the size effect of factors that influence language acquisition. A recent interest is shown in literature about the effect of social and economic family status on the language acquisition in infants. There are evidences underlining slower rate in the acquisition of linguistic milestones for infants from low SES backgrounds compared to peers from high SES.
The current study is a meta-analysis created to measure the influence of the SES in infants' spontaneous speech. Spontaneous speech is considered as one of the most representative measure of infants' vocabulary size.
Analysing papers in literature, regarding inclusion criteria, linguistic measures were accepted when data was collected in spontaneous contexts. Studies with infants older than 6 years old were excluded. There were no restrictions about SES assessment, geographical areas and native languages.
Nineteen papers studying the SES impact on the spontaneous lexical production were found in literature. Applying the inclusion criteria, six papers fitted the meta-analysis' aims.
Statistical analysis has shown that SES plays a role in the variation of the different linguistic patterns among infants. The current meta-analysis indicates that the 9% of variance of linguistic performances are explained by SES.
The SES has a reliable but small effect on the infants' spontaneous speech. Further works are needed with more significant samples, using shared linguistics and SES measures and assessments.

PC - 004 Development of timing of turn-taking from adolescence to adulthood

Lilla Magyari, Ilona Kovács
Pázmány Péter Catholic University, Budapest

The recent study explores the development of the neurocognitive development of language and auditory-motor coordination from adolescence to adulthood. Our experiment focuses on communication skills, especially, the timing of turn-taking with behavioral methods. In everyday conversations, the gap between turns of conversational partners is most frequently between 0 and 200 milliseconds. The short transitions suggest that listeners are able to predict when a current turn is coming to an end and can time well their own turn to the end of a previous turn. Hence, timing of turn-taking in conversations relies on several processes: linguistic and timing predictions, and

auditory-motor coordination. In this study, a button-press paradigm was applied to study turn-end predictions in the different age groups: in early adolescence (11-13 years), in late adolescence (15-17 years) and at adults (>21). Our data shows the performance for predicting turn-ends improves from early adolescence to adulthood.

PC - 005 Physically performing actions enhances memory for verb sequences in children

Angie Makri, Chris Jarrold
University of Bristol, UK

Enacting (i.e. physically carrying out) short action-object phrases has been repeatedly shown to lead to better memory recall compared to verbal learning in children. This enactment advantage is thought to be specific to item information (memory for individual items) but not relational information (memory for the serial order of the items presented). This project examined item recognition and order reconstruction after enactment and verbal encoding separately for actions and objects in children. Based on previous findings, it was hypothesised that enactment would facilitate item-specific processing for objects while relational processing (order information) would only benefit from enactment for the actions. The study employed a 2 (enactment or verbal encoding) by 2 (item recognition or order reconstruction) x 2 (action or object memory) repeated measures design. Thirty-four children (Mean age = 8.05, SD = 0.63) were randomly selected from the university database. Eight foam objects and eight action words were used as the stimuli during encoding. During the recall phase, participants responded by clicking the correct items on a computer screen. The results suggest that overall, enactment encoding did not lead to superior item or order performance. However, a significant interaction between encoding mode and probe type revealed that enactment facilitates memory for order information but only for the actions. It is concluded that enactment benefits relational processing but this effect is specific to action-related words. In accordance with our previous findings, it appears that action and object words may be stored and processed in a different manner in children.

PC - 006 Infants' encoding of location and appearance of pointed-at and reached-for objects, when both appearance and location are relevant

Mikołaj Hernik1, Dan Sperber1,2, György Gergely1
1Central European University, Budapest, Hungary
2Institute Jean Nicod, Paris, France

Nine-month-olds encode appearance (i.e. typically a non-transient, kind-diagnostic characteristics) of a pointed-at solitary novel object at expense of its location (i.e. transient non-kind-diagnostic characteristics). The opposite is true for reached-for objects (Yoon, Johnson & Csibra, 2008). Since kind-diagnostic features of novel objects may carry high relevance for young learners, it is not clear

whether their preferential encoding reflects a general kind-bias in infants' responses to ostensive pointing, or may it stem from relevance-guided inference. In the current study we hypothesized that infants will encode location of pointed-at object, if its location has high relevance. Nine-month-olds (n=24) watched a series of movies closely modelled after Yoon et al's stimuli. However, in each trial the pointed-at (or reached-for) target-object was one of 3 identical objects present and it was located at the far side of the screen, spatially separated from the other two. After 3-seconds-long occlusion of all objects, the target-object was revealed either in its old location (baseline), on the opposite side of the screen (location-change) or in old location but swapped for a different-looking object (appearance-change). Infants' looking to these outcomes was recorded until first look away from the screen. Results suggest that infants (N=24) detected appearance-change but not location-change of the pointed-at object and detected neither for reached-for object. However, highly-attentive infants (N=10), who watched the screen continuously throughout occlusions, detected only location-change of reached-for target and only appearance-change of pointed-at target. Altogether, the current results are more in line with kind-bias hypothesis than with relevance-guided-inference hypothesis.

PC - 007 Mobile device usage is associated with cognitive skills in preschool children

Veronika Konok[1], Bence Ferdinandy[2], Zsófia Ágnes Réti[1], Nóra Bunford[1,3], Ádám Miklósi[1,2]
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Owing to their usability, touchscreen devices (smartphones, tablets) are used by an increasingly greater number of children and at an increasingly younger age. As these devices offer a different type of sensorimotor stimulation than traditional games and their use takes time away from other activities, they may influence cognitive development.
Several measures of cognitive and fine motor skills were administered to 4.5 to 6-year-old children, 20 of whom were frequent mobile device users and 20 of whom did not use such devices at all.
Users exhibited worse performance on theory of mind tasks, but faster (but not better) responses on a divided attention task, relative to non-users. Additionally, while in younger children mobile device usage positively affected emotion recognition and selective attention skills, in older children (who have also been using the devices longer) it had negative effects on these outcomes. In children of parents with higher education, mobile device usage had positive effects on emotion recognition, fine motor skills and response speed in the selective attention task, while in children of parents with lower education, it had negative effects.
Results show that mobile device usage has primarily negative but some positive effects on children's cognitive skills, with some of these manifesting only after longer duration of use. In addition, the children of parents with higher education may benefit from careful parental selection of downloaded contents that may have improving effects. Future studies need to investigate the effects of specific contents, and how the effects of use change over time.

PC - 008 Is ascribing false beliefs less difficult than considering them to ascribe intentions?

Britta Schünemann, Marina Proft, Hannes Rakoczy
Georg-August-University, Germany

Much research has investigated children's developing concept of intention. One aspect that has received little attention, though, are the epistemic conditions on intentions: Intending to perform an instrumental action presupposes the belief that the planned action will lead to the desired outcome (Moses, 2001). Previous results that manipulated an agent's knowledge about her actions' consequences employing an aspectual false belief found that children, though being able to base action predictions on a false belief, were unable to consider these when ascribing intentions (Kamawar & Olson, 2011).
In concordance with recent findings that aspectual false beliefs are as difficult to ascribe as non-aspectual false beliefs (Rakoczy et al., 2015), this study investigates whether the gap between ascribing a false belief and ascribing an intention depending on this belief holds in similar ways for aspectual and non-aspectual false beliefs. To this aim, children's performance on structurally similar belief and intention test questions regarding analogous scenarios in which an agent acts on aspectual/non-aspectual false beliefs is compared. Data collection is ongoing, preliminary results, however, show the following pattern: 3-year-olds mainly fail to correctly ascribe both, beliefs and intentions. 4- and 5-year-olds show a clear performance gap: Even though making correct predictions about actions induced by the false belief, they falsely ascribe an intention to the agent neglecting her false belief. Such a pattern indicates that the ability to ascribe beliefs is necessary but not sufficient for considering the epistemic aspect of intentions, suggesting a further cognitive step between ascribing the two mental states.

PC - 009 Correlates of Pretend Play in a Non-western Preschool Sample

Deniz Tahiroglu
Bogazici University, Turkey, Ozyegin University, Turkey

Recent studies, mostly conducted in the West with English speaking participants, point out the importance of pretend play in children's social-cognitive development. Given the reported cultural differences in play (e.g., frequency of pretend play, themes portrayed in play; Chessa et al., 2013; Farver & Shin, 1997; Goncü & Gaskins, 2007), it is also important to examine the correlates of pretend play in different cultural contexts. In current research, links between pretend play, theory of mind (ToM), executive functioning (EF), and creativity are explored in a non-Western sample. 120 3- and 4-year-old Turkish children (58 girls; Mage = 3 yrs 9 mos, SD = 6 mos) and their parents participated. Data reveal that, as expected, age is correlated with children's language, ToM, and EF performance, r's ranging between .25 and .53, p's < .02. However, age is not significantly correlated with children's pretend play behaviors (e.g., using a body part or an imaginary object in the pretend action task).

Nonetheless, pretend play behaviors are correlated with performance on ToM, EF, and verbal creativity tasks (r's > .22, p's < .04). Data also show that although certain play behaviors such as having an imaginary companion is not a common occurrence in this age group in this sample (<10% of the sample are coded as having an imaginary companion-prevalence rate much lower than those reported in other Western and non-Western samples; Motoshima et al., 2014; Taylor et al., 2013), correlates of pretend play are similar to those reported in the literature.

PC - 010 Joint engagement influences 10-month-olds looking at object during word learning

Eugenia Wildt
Paderborn University, Germany

A number of studies endorse the approach that infants use perceptual salience as a primary strategy for word learning (Pruden et al., 2006). We argue that even though salience is an important attention-getter for infants, when applied for a joint goal (Rohlfing et al., 2016), social cues guide word learning from early on. The purpose of this eye-tracking study was, therefore, to investigate, whether joint engagement can drive infants' attention away from salient to "interaction-charged" objects.
Within an Intermodal Preferential Looking Paradigm, a visual "interesting-boring object-set" was presented to 42 German 10-month-olds. At baseline, as expected, significantly longer looking occurred to the salient object compared to the boring one: t(41)=2.23, p=.03, d=.53.
In a following training phase, infants were assigned to one of two conditions. In each condition (N=21), sitting at a table, the experimenter labeled the boring object while showing its functional role. Afterwards, she either engaged with the child by jointly achieving the function (joint engagement), or she let the child explore the item by her- or himself (self-exploring).
Preliminary findings from the post-test suggest that the self-exploring group proceeds to fixate the salient objects significantly longer after hearing the target word, t(20)=2.83, p=.01, d=1.23, while the joint engagement group overcomes the initial salience-effect, resulting in a non-significant difference in looking time to target and distractor: t(20)=0.41, p=.68, d=.18.
Our results suggest that providing a label to a less salient object accompanied with joint engagement can 'charge' it and reduce the role of salience.

PC.e - 011 Joint goal representation in infants: a fNIRS study

Katarina Begus, Arianna Curioni, György Gergely, Guenther Knoblich
Central European University, Hungary

Infants' goal attribution, and subsequent prediction of future goals of others, is restricted to actions that are efficient. If infants observe agents taking unnecessary detours towards a target, infants do not attribute nor predict agents' future goals (Hernik & Southgate, 2012). In contrast, adult studies,

investigating coordination of two agents, have shown that trajectories detouring from the optimal path can have a communicative function, serving the joint goal of coordination (Candidi et al, 2015). Using fNIRS, we investigate whether 9-month-olds would perceive individually inefficient actions as goal-directed, if these actions are performed in the context of two agents coordinating towards a common goal. Analysis was focused on activity in the left anterior parietal region, which, analogous to adult data (Hamilton & Grafton, 2006), showed repetition suppression for repeated goals and a release from suppression for new goals in infants (Southgate et al, 2013). Preliminary results indicate a release from suppression in left anterior parietal region, when infants observed two agents coordinating towards a new goal, and repetition suppression when the goal was repeated. These results suggest infants attributed a joint goal to the agents, despite both agents' actions being individually inefficient, indicating that infants may represent joint actions differently to the sum of individual actions, and appear sensitive to the same cues to cooperation as adults are.

PC.e - 012 Spatial indexing in false-belief tasks: A continuous eye-tracking study

Paula Rubio-Fernandez
Massachusetts Institute of Technology, USA

Using a video gaze-tracking technique, Clements and Perner (1994) were the first to observe that toddlers are able to anticipate the correct outcome of a false-belief narrative despite failing the corresponding test question (e.g., 'Where will Sam look for his cheese?' after the cheese was transferred from one container to another in Sam's absence). Toddler's differential performance in these two tasks was interpreted as evidence of a distinction between implicit and explicit Theory of Mind (see also Garnham & Ruffman, 2001; Ruffman et al., 2001).
Here I present the first false-belief study with preschoolers (ages 3 and 5 years) recording continuous eye-movements, which allowed me to replicate the original findings in a more controlled environment (Experiment 1), while also addressing the following questions: After a non-verbal anticipatory phase, what effect does an indirect test question have on preschool children? ('Let's see where Martin comes out for his ball'). Does the mention of the target object draw children's attention to the wrong location? (Experiment 2). And if the indirect test question is presented before the non-verbal anticipatory phase, do preschool children 'recover' from the distraction? (Experiment 3).
Looking patterns reveal clear differences between the 3- and the 5-year-olds. However, the results of a true-belief control (Experiment 4) show that both groups are affected by spatial indexing (Richardson & Kirkham, 2004). That is, preschool children keep track of the location first visited by the agent when predicting his return, suggesting an interaction between Theory of Mind and memory processes in false-belief tasks.

PC - 013 Children's Sensitivity to Water and Food Contamination in Tanzania, East Africa

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From early to middle childhood, children develop skill at detecting when water and food are safe to consume, or contamination sensitivity (Siegal & Peterson, 1999). This research has been conducted mainly in Western settings and little is known about it in the developing world where unsafe water supplies, sanitation, and hygiene account for most life-threatening diseases in children (WHO, 2015). Everyday responsibilities such as collecting water and food preparation put children in the developing world in direct contact with contaminants. This study investigated contamination sensitivity in 4- to 9-year-old children (N = 75) in a peri-urban region of Tanzania. Children were interviewed about 10 pictorial stories concerning water, food, contagion, and vectors (e.g., bug in juice) that varied in contamination status. Based on prior research, we predicted age-related improvements in contamination knowledge; though, given the local context, we expected high levels of knowledge at all ages. Performance was very good, with no age differences on contamination stories; older children performed better on stories depicting safe situations. The age groups performed similarly on stories about water, contagion and vectors; older children performed better on food stories. Explanations for contamination were similar to Western samples and included awareness of invisible contaminants (i.e., germs, toxins), especially among older children. Some vulnerabilities of the youngest children appeared. Findings reveal high levels of contamination sensitivity, comparable to levels in Western samples. They expand our knowledge about children's contamination sensitivity in non-Western settings and have implications for interventions aimed at improving children's health.

PC - 014 Young children's gestures reveal the core properties of language: the effects of spatial coherence and the establishment of common ground

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Research has shown that young children spontaneously reshape their gestural communication systems in language-like ways. Specifically, when using silent-gestures to depict holistic motion events (e.g. ball bouncing down hill), young children segment the semantic elements and arrange these into linear sequences, resembling the core properties of language. This tendency is strongest in children aged 4 to 5 years; nevertheless, it remains unclear what factors might be driving these age-specific effects. Moreover, it is unknown whether children's gestural segmentation may be modulated the establishment of common ground or the perceived knowledge of their interlocutor. Here, we analysed the silent gestures of typically-developing children (3-7 years; N=70) used to describe motion events. We explored whether the establishment/diminishment of common ground with their interlocutor influenced their tendency to segment information. We also explored whether gestural segmentation

varied as a function of verbal fluency, attentional flexibility and spatial coherence. Results showed that gestural segmentation increased when common ground was diminished, but only for children aged 4 and over. Controlling for this effect, children with poorer spatial coherence were significantly more likely to segment information, but receptive vocabulary and attentional flexibility had no effect. Our results suggest that once theory of mind is in place, children may use gestural segmentation to facilitate communication of the semantic features of the event. Common ground thus appears to have a modality-independent effect on communication. The inability to bind features of an event into a holistic unit may also be driving the segmentation of information in young children.

PC - 015 Reputation management and egalitarianism in 5-7 year-olds of two cultures

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We investigated 5-7-year-olds sensitivity to reputation by manipulating the context of a sharing game. We anticipated older children would modulate their sharing to appear fair when the outcome was public versus private, and that this might depend on culture. We age-matched US children with children from rural, traditional Samoa, a culture that promotes public gift exchange and egalitarianism while deemphasising individual privacy (Shore, 1989). Ninety children (N=45 in Samoa & USA) played an iterative sharing game. In counterbalanced public and private conditions, children split collections of tokens of varying value. Public sharing used transparent containers and was observed by the experimenter; private sharing utilised opaque containers without observers present. We compared the proportion of tokens kept by the child as a function of condition. Egalitarian sharing was more common in Samoa where a majority of children split tokens equitably in both conditions. However, in both cultures when children did modulate their sharing, by 7 years they gave more to themselves in private versus public. We also document sharing strategies that tended to be more common in Samoa, e.g., splitting the tokens equitably in absolute number (3 to both players), but not in terms of value (child kept one plain and two special coins but gave partner three plain coins). We confirm greater egalitarian sharing in collectivistic Samoa. However, by seven years we also demonstrate that children in both Western and non-Western contexts engage in reputation management, modulating their sharing based on the observation of a perceived audience.

PC - 016 Critical thinking at school: flexible reasoning in word problem solving

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How to develop and measure students' arithmetic concepts? How do procedural and conceptual skills interact in this development? We already know that students have preconceptions on mathematics

concepts (Fishbein, 1989) that provide a partial view on the to be learnt notion. Their problem's analysis can intuitively rely on superficial features, triggering a wrong categorization of the situation (Chi, 2008) and a rigidity of encoding (Rittle-Johnson et al., 2001). Hence taking into account preconceptions is key to studying conceptual difficulties (Bassok et al., 1998), but also to develop cognitive flexibility. Cognitive flexibility can therefore be measured through the knowledge of multiple strategies and of their efficiency (Rittle-Johnson & Star, 2007; Star & Seifert, 2006). In this study, we use word problems solving by two strategies to explore the degree of conceptual development. Studying the spontaneous strategies used to solve this kind of isomorphic problems are key to measure conceptual development. Starting from this point, we proposed a teaching method based on recategorization principle in order to develop flexible and multiple points of view on a problem. The study was conducted with 8 classes (4th-5th Gr) from high-priority education schools following this protocol: pre-tests, 5 learning sessions for experimental and control groups, post-tests. The experimental method allowed experimental students to improve more than control students in ability to use the abstract strategy (0.63 vs 0.43, $F(1,140) = 8$, $p=0.005$) even in the less intuitive contexts and to consider the two successful strategies (1.59 vs 1.09, $F(1,140)=6.1$, $p=0.01$). Educational entailments are discussed.

PC - 017 When do children appreciate doing the right thing for the right reason?

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For us as adults a prosocial action is only moral if it is done with the right intention. This amounts to the so-called 'meaning of an action': even if two actions are physically identical, they can constitute different (im)moral actions depending on the underlying intentions (Scanlon, 2008). For example, the action of calling my sick grandmother has a different meaning depending on whether I freely chose to do so or whether my mother forced me to. In the present study, we tested whether pre-schoolers similarly value the right thing done for the right reason over the right thing done for the wrong reason. 3.5-, 4.5- and 5.5-year-olds (N=96) were helped in a marble collection game by two puppets. The prosocial puppet helped spontaneously out of niceness while the strategic puppet requested a reward for her helping behavior. Already 3-year-old children preferred the prosocial over the strategic puppet in subsequent behavioral measures: they selectively provided help for the prosocial puppet (27 out of 32, $p<.01$) and asked her more often for help in a new cooperative task (23 out of 32, $p<.05$). Only the older children, however, explicitly acknowledged the different underlying motivations of the puppets (4-year-olds: 18 out of 31, $p<.01$, 5-year-olds: 26 out of 33, $p<.01$) and only the 5-year-olds explicitly stated the prosocial puppet to be nicer (24 out of 33, $p<.05$). Thus, while already 3-year-old children distinguished between the underlying motives for the helping behavior provided by the puppets only the older children made this explicit.

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PC - 018 Even indirect communication influences infants' expectations about others' belief-based actions

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Making sense of others' behavior based on their underlying mental states is crucial in humans' everyday live. Communication often serves as a cue that helps understanding these mental states. However, only one study investigated whether communication influenced infants' expectations about the actions of an agent who held a false belief. Song and colleagues (2008) found that 18-month-olds updated their expectations after hearing direct – informative – communication ("The ball is in the cup") but not after hearing indirect communication ("I like the cup"). This is surprising given that infants understand seemingly uninformative communication as indirect hints for actions (Schulze & Tomasello, 2015).
To address these contrasting findings, we tested 18-month-olds (n=77) in 4 between-subjects conditions: After inducing the false belief, the assistant used the two utterances described above; either without interruption between phases (Study 1) or – following Song et al. more closely – with a curtain blocking participants' view between phases (Study 2).
In Study 1, we found no significant effects. In Study 2, we found a main effect of event ($F(1,36)=15.853$, $p<.001$, $\eta 2=.324$). Infants expected the agent to search the ball in the cup rather than the box in the direct but also, importantly, in the indirect communication condition.
Thus, 18-month-olds understand indirect statements as communicative acts that update an agent's false belief. Surprisingly, updating was found only when there was a delay between communication and test phase. Since following the agents' actions required extensive processing, the delay might have facilitated children's tracking of mental states and communicative intentions.

PC - 019 Young children's preferences for ingroup and outgroup members

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Research on group cognition has revealed many preferences and biases. For instance, people tend to favor ingroup- over outgroup-members, and people often perceive ingroup members as diverse individuals, whereas they tend to perceive outgroup members as exemplars of a category with much less variation between individuals – known as outgroup homogeneity effect (OHE).
The present research aimed at investigating the development of ingroup preferences and the OHE in toddlers (n=20, range=16-30 months). To establish ingroups/outgroups, we used the food preference paradigm by Mahajan & Wynn, 2012: Children chose between two food options (peas/crackers) and were marked with a color according to their preference, similarly as in minimal-group paradigms. Subsequently, children chose (a) between two puppets, one with the child's food preference (ingroup) and one with the reverse preference (outgroup), each marked with the corresponding colors, and (b) between two puppets who had not exhibited food preferences themselves but were marked with the ingroup/outgroup color. The OHE was tested via a search paradigm used in research on object individuation (Van de Walle et al., 2001): We tested whether toddlers more readily individuated ingroup members as compared to outgroup members.
The results showed that the manipulation of in- and outgroup failed: toddlers preferred puppets with similar and opposite food preferences, and those marked with the according colors, at chance levels, and consequently there was no difference in the individuation task.
This result highlights the importance of replication studies, and the need for robust paradigms for the induction of in- and outgroups in toddlers.

PC.e - 020 Effects of games on sharing and social inclusion in preschoolers

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Games are an essential part of a child's life. One central characteristic of children's games is the context, in which they are played. Herewith, relations between players' goals are meant. From Social Interdependence Theory, three different gaming contexts can be derived: cooperative, competitive, and solitary. Previous research documents, that playing games cooperatively promotes more prosociality towards co-players than playing competitively or solitarily. Yet only a few studies examined a possible carry-over effect of gaming context on prosociality toward unfamiliar others (i.e. no co-players). We used an experimental design, in which dyads of 4- to 5-year-old children played the same game either cooperatively, competitively, or solitarily. Hereafter, a Dictator Game and inclusion of unfamiliar others was assessed. Additionally, free play of the dyads was observed and coded concerning gaming context and prosociality. Preliminary results (N = 60; status: September, 27th 2017) reveal that cooperative games, but not competitive or solitary games, promote the willingness to share with unfamiliar others. Inclusion of unfamiliar others seems to be fostered via both cooperative and competitive games, but not solitary games. Concerning free play behavior results indicate that competitive games lower subsequent cooperative free play as compared to cooperative and solitary games. These preliminary findings suggest that games might be an important factor for preschoolers' acquisition of prosociality.

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PC - 021 Representational momentum in displacement tasks: Relative object weight matters in toddlers' search behaviour

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Previous research has demonstrated that young children's successful search behaviours in object displacement tasks are dependent on various factors, including object weight. For example, relative heaviness of a ball leads to an increase in incorrect straight-down searches in the gravity bias task, but relative lightness appears to reduce such searches. One suggestion is that this is due to representational momentum (RM) in children – for instance, objects are anticipated to have more momentum if a slope is steeper, and the objects are expected to be found in a location farther from where it actually is, even if this means for the object passing through a barrier. While other work has addressed the general issue of RM in toddlers, none has focused on the role of object weight. Toddlers (N = 60) aged 2, 2½ and 3 years took part in a task where either a heavy or a light ball rolled down a ramp and behind an occluder with four doors, with a barrier placed along the ramp after a door. The children were allowed to search for the ball. The toddlers either had prior visual and tactile experience of only the test ball or of both balls. Search accuracy generally increased with age. However, for the 2½- and 3-year-olds the accuracy also significantly depended on condition. Relative lightness was related to increased search accuracy and relative heaviness to reduced accuracy. Further analyses also revealed RM-related error magnitudes were driven by this factor.

PC - 022 Generic Information Supports the Fast-Mapping of Novel Labels

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Multiple studies have shown that children are capable of fast mapping words and facts onto objects. In three studies, we assessed how labels and (generic or specific) facts presented together or separately influence their short and long-term retention. During an object-matching game, 4-year-old children were incidentally presented with novel labels and facts about novel objects. We tested recall immediately, and at a 1-week delay, when the labels and facts were presented separately for different objects (Study 1), when labels and facts were presented together at the same time for an object (Study 2), and when labels and facts were presented for the same object but with a time interval in between (Study 3).
The results revealed that 1 week after presentation, only generic facts were remembered if labels and facts had been presented separately or with a gap in between (Studies 1 and 3). When labels and generic facts were presented together (Study 2), 4-year-olds displayed better long-term retention of both novel names and generic facts. Taken together, these studies show that kind labels and kind-generic facts support each other in children's long-term memory.

PC.e - 023 Pedagogical cues and action complexity modulate transmission of information in two-years-old children

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Two-year-old children are more likely to transmit new information after learning it in a pedagogical rather than an intentional but non-pedagogical context (Vredenburgh, Kushnir, & Casasola, 2015). In the present study we asked whether action complexity could mediate the effect of pedagogical cues on information transmission.Twenty-four-month-old children (N = 31) interacted with two unfamiliar adults who demonstrated them two actions leading to a comparable outcome on two novel toys. One of the demonstrators showed a simpler action in an intentional, but non-pedagogical manner, while the other showed a more complex action in a pedagogical manner by using verbal cues, direct eye contact, and child-directed speech. Following demonstration, children were equally likely to imitate both actions, but achieved the action outcome significantly more often with the simpler action. The children were then encouraged to demonstrate either action to an ignorant familiar adult who was not present during demonstrations. While children showed both actions during transmission, they were significantly more likely to demonstrate the simple action, even though it was presented without the explicit pedagogical cues. These results suggest that action complexity may undermine the role of explicit pedagogical cues in information transmission mechanisms in infancy.

PC - 024 Motherese and motionese combine forces: Evidence for multi-modal learning in infants

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When interacting with their infants, mothers adjust both their speech (motherese: Fernald et al., 1989) and their actions (motionese: Brand, Baldwin, & Ashburn, 2002). Independently, these modifications have been shown to facilitate word (Ma et al., 2011) and action (Williamson & Brand, 2013) learning, respectively. Yet, whether they are interrelated or independent and whether the learning benefits of motherese also operate multi-modally to facilitate action learning is unknown. For the first time, we combined mothers' infant-directed speech and action recordings to assess the relation of motherese and motionese. In our study, 36 mothers demonstrated four novel objects each with a unique opaque function to their 14-month-olds. Mothers were free to talk to, demonstrate, and exchange the objects with their infant. Speech was recorded with an unobtrusive microphone and action kinematics were tracked using wireless motion tracking. Infants' action learning was assessed by scoring their subsequent ability to operate each object. When addressing their infants, mothers demonstrated modifications in both their prosodic speech characteristics (e.g., pitch range) and their movements (e.g., motion path length). Interestingly, mothers who adjusted their motion path lengths more also

used wider pitch ranges when talking to their infants (r(36)=.34, p=.044). Moreover, wider pitch ranges and longer motion paths together significantly predicted infants' successful action learning (F(2,33)=3.696, p=.036). To sum up, these findings suggest a close relation between motherese and motionese and offer novel implications for multi-modal learning in infancy.

PC - 025 Learning to Deceive has Cognitive Benefits

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In the present study, we tested a hypothesis that learning to deceive may confer cognitive benefits. 69 3-year-old were invited to play a competitive hide-and-seek zero-sum game. After a pretest, the 42 children who could not deceive in the game and repeatedly told the truth about the whereabouts of the treat were randomly assigned to two conditions: Those randomly assigned to the experimental condition were instructed how to deceive the opponent to win the game each day during the training phase, whereas those in the control condition did not receive any instructions about how to win the game. Children in both conditions played the game for four consecutive days. Training effects on executive function and theory of mind skills were assessed through a pretest and a posttest. The results showed that the experimental, but not the control, children significantly improved their executive function and theory of mind skills. Although previous work has suggested deception is correlated with cognitive skills, this is the first evidence that learning to deceive causally enhances cognitive skills in young children. Our findings demonstrate that teaching children to engage in the kind of complex social coordination involved in deception can promote their executive function and theory of mind skills. They support current theories that link human sociality to complex cognition and highlight the causal connections between social interaction and cognition during a time period of rapid development. From a practical perspective, our findings suggest that children can benefit from learning to play deceptive games.

PC - 026 Developmental aspects of electrodermal activity

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We can use electrodermal activity (EDA) in psychological research to measure emotion-induced changes of arousal, for example those, associated with lying. There are only few studies which explore age differences of EDA, but none of these investigates lying. According to the results of Lewis and his colleagues (1989) even very young children could solve a peeking task, however, it is not clear if psychophysiological reactions, typical in adult lying are present. We tested electrodermal changes in a lying game. Subjects' task was to hide an object, and they were questioned about the place of this hidden object. If they could successfully hold back the information, they received it. According

to our previous results, motivation effects electrodermal responses during a Stroop test in adults (Gönye et al., 2015). Hence, in the present study, a baseline session was followed by a motivated session. We compared electrodermal changes of withholding information in these two sessions in three age groups: university students, primary school students and preschool students. Interestingly, lying did not induce significant changes of EDA in any of the tested groups, and motivation had a significant effect only in the group of university students. Our results are in line with results of Lewis and colleagues, who reported that facial and bodily activity did not differentiate 3-year old deceivers from truth-tellers. We point out certain methodological aspects, important in the analyses of EDA, and conclude that the developmental differences of the psychophysiological states accompanying lying needs further investigation.

PC.e - 027 Do young infants have an attentional preference for social interactions?

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From early on, humans preferentially attend to social signals, such as human faces, bodies, and voices. In the current study, we investigate whether such an attentional preference also applies to social interactions. Based on prior studies documenting a qualitative change in active social behavior from around 9 months of age (the "9-month revolution"), we examine the attentional preference in infants older than 9 months (9.5–11.0 months) compared to infants younger than 9 months (7.0–8.5 months). Furthermore, we study whether a potential attentional preference corresponds with infants' active social interaction patterns.

By using eye tracking, we measure infants' looking time while they are simultaneously presented with two kinds of videos: In one video, two agents turn towards one another, engaging in social interaction. In the second video, the same two actors turn away from one another, performing the identical movements individually (non-interactive control). To assess infants' active social interaction behavior, we code their social engagement during free play with their parent.

Preliminary results of the currently ongoing study suggest that infants older than 9 months prefer to look (i.e., look more than 50% of their total looking time) at social interactions (p = .004). Infants younger than 9 months do not show this pattern (p = .87). The findings will be discussed concerning early childhood development of social attention. Moreover, the relation between infants' attentional preference for social interactions and their active social engagement will be discussed.

PC.e - 028 Four-year-old Children Selectively Imitate the Other's "Intentional" Action with Taking Interjection as a Cue

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Verbal communication often contains interjections, such as "ach" or "whoops" in English, which are often regarded as part of nonverbal vocal communication since they contain rich prosodic information and function as emotional signal. Adults spontaneously insert different interjections in different utterance context. However, the acquisition process of such utterance in development remains unclear. The current study focused on the possibility that the Japanese interjections "Ach" and "Ei" deliver information about different intentional states behind the speaker's action. Exp.1 confirmed that it is the case for adults (N = 36, Japanese speakers) at least at the explicit level: they scored different level of intention when different interjections were presented in synchrony with the same visual event ("Ei" represents higher level of intention). In Exp. 2, an imitation task, each participant was shown through the monitor 2 different actions on the same object (in a counter-balanced order). One of the action was presented with "Ach" and another with "Ei". Both interjections were synthesized and had virtually same pitch and envelope. Four-year-old participants (N = 22) produced significantly more "Ei" action than "Ach" action in the response phase, when they were required to imitate. These findings suggest that the phonetic contrast of interjections, independent of prosodic information, may function as a cue for the perceiver to process the speaker's intention by the age of 4 years at latest. Cultural-comparative study is needed in the future study to examine what human-universal and language-specific factors contribute to form such a behavioral trait.

PC - 029 Influence and Preference in Development: How others' product evaluations affect children's decisions about value

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Understanding the way children value objects, and the extent to which their evaluations can be influenced is critical for successful marketing. Here, we examine the extent to which children's toy evaluations are influenced by peer reviews. Children were asked to evaluate a series of toys in the presence of positive, negative or neutral peer reviews. Across two studies we demonstrate that 5-to-6-year old children alter their evaluation of products in line with positive and negative reviews, increasing their evaluation of products that they believe are popular amongst their peers, and decreasing their evaluation of products that appear unpopular. To address the question of whether this shift in evaluation reflected conformity to peer review, or a real change in their product preference, a subsequent behavioural choice task was employed. This task revealed that the majority of children (74%) maintained their original preference, indicating that reported shifts in product evaluation were the result of peer conformity. These findings indicate that by age 5, children are influenced by peer reviews when reporting evaluations, but simultaneously maintain their own private preferences. This work provides a novel task for studying the development of conformity, and practical implications for commercial marketing with young children.

PC - 030 Does Bilingualism Modulate Children's Beliefs on the Origin and Stability of Language and Physical Traits?

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How do children reason about the origin and stability of individuals' traits such as language, race, or physical characteristics? Kinzler & Dautel (2012) found that four to five-year-old monolingual Caucasian children believed language to be more stable than race. In a switched-at-birth paradigm, Byers-Heinlein & Garcia (2015) showed sequential bilingual children were more likely than monolingual children to believe that native language and physical traits would match adoptive rather than biological parents. Here, we sought to extend these findings by investigating children's reasoning about the stability of language, race, and physical characteristics in Catalan-Spanish four to six-year-old simultaneous and sequential bilinguals. Experiment 1 was based on Kinzler & Dautel's (2012) task, which juxtaposes race (Caucasian and African-American) and language (Catalan-German). In Experiment 2, children were presented with the switched-at-birth paradigm (Byers-Heinlein & Garcia, 2015). Results from Experiment 1 showed bilinguals were equally likely to think that an individual's race or language could change over time. Experiment 2 results showed that simultaneous bilinguals were equally likely to believe that an individual's language and physical traits would match birth or adoptive parents, whereas sequential bilinguals believed all traits came from the adoptive parents. These findings are in line with Byers-Heinlein & Garcia 2015, suggesting that the language learning experience of sequential bilinguals reduces not only essentialist beliefs about language but also about non-linguistic aspects as physical traits. Our study supports the idea that learning two languages during development facilitates a more flexible and transformable understanding of social categories and individual traits.

PC - 031 Concept combination is difficult, even if you have the constituent concepts at your disposal

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Within theories of concept learning, compositionality plays a central role. A theoretically important question is how concept combination contributes to the acquisition of new concepts. However, it remains an independently interesting and largely unexplored question how the ability to combine concepts arises in development. There exists a lot of data concerning the development of certain

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domain-specific concepts, but much less about how different domains are combined by children. In a previous study we used tasks that required subjects to combine concepts of integer number with those of false belief and perspective taking. We found a delay of 3-4 years between mastering the constituent concepts and passing the combination tasks, which we attributed to performance factors. Presently we are working on reducing the performance load associated with our tasks. In our False belief with counting (FBC) task subjects saw an assistant put a certain number of balls in a box, then leave, followed by another assistant who dropped one more ball in the box. On return of the first assistant who either peeked or did not peek in the box. Ss were asked how many balls she thought there were in the box. In a new control condition the first assistant watches while the second drops her balls. In another version the two assistants drop balls of different color into the box. We will present the results obtained with these easier tasks. This reduction of performance load seems necessary before we test more specific hypotheses about concept combination.

PC - 032 Exploring the impact of maternal speech on 7.5-month-olds' segmentation abilities

Melanie Steffi Schreiner, Nivedita Mani
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Starting in the mother's womb, language learning benefits from maternal speech exposure (DeCasper & Spence, 1986). In line with this boost in learning through the mother's voice, the current study explores whether maternal speech also facilitates infants' word segmentation. Fifty-two monolingual German infants of 7.5-months of age were exposed to passages of sentences containing two pseudo words. Importantly, half of the infants were listening to recordings of their own mother whereas the second half listened to a novel speaker. In the test phase, infants were exposed to isolated tokens of the familiarized words and two other novel control words. The analysis of the test phase revealed no significant interaction of infants' word recognition and speaker ($F(1,49)= 0.15$, $p=.698$, $ap2=.003$). However, there was a significant interaction between infants' word recognition and their familiarization ($F(1,49)= 6.36$, $p=.015$, $ap2=.115$). Splitting by familiarization time, infants with shorter listening times revealed a novelty effect, listening significantly longer to novel control words than familiarized words ($t(51)=-2.52$, $p=0.015$, $d=-0.349$). Infants with longer listening times during familiarization showed a familiarity effect, listening significantly longer to trials with the familiarized words than to novel controls ($t(51)= 2.81$, $p=0.007$, $d=0.390$). Together, these results demonstrate that a) there are individual differences in infants' listening behavior which may be related to their listening times in the familiarization phase, and b) infants are able to segment words from maternal fluent speech but also from a novel speaker demonstrating flexibility in recognizing words.

PC - 033 Acquiring a proper name via the speaker's false belief

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Proper names pick out particular individuals and are learned through specific acts of labeling. Suppose a speaker has a false belief about the identity of a dog currently in a box and mislabels it with her pet dog's name. Will a young child assume that the dog actually in the box at that moment is named or will the child correct for the speaker's false belief and learn the name of the speaker's intended referent? We presented 3-year-old subjects with a narrated, illustrated story in which Sally puts one of two identical dogs in a box and leaves. In the actor's absence, this dog jumps out of the box and leaves the scene; the other dog then jumps into the box. Sally returns with her friend, points to the box, and says, "That's Fido in the box"; the friends then leave. In the test scene, the first dog returns and the two dogs are presented side by side. Subjects are asked to point to Fido. Initial results are suggestive: out of 20 three-year-olds (mean = 41 months, SD = 3.41; range = 36-47), 15 pointed to the correct dog—the speaker's intended referent (Binomial $p=.04$, two-tailed; $BF=3.22$ in favor of H1). Three-year-olds appear to correct for the speaker's false-belief about identity in a labeling task. Early theory of mind (ToM) may sometimes be able to represent false beliefs about object identities, suggesting a strong continuity of competence with later ToM. Speaker's intent may override stimulus-world associations in early world learning.

PC - 034 Implicit and explicit sequence learning in Tourette syndrome

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Tourette syndrome (TS) is a neurodevelopmental disorder characterized by motor and vocal tics and also by frontal/basal-ganglia abnormalities. Basal-ganglia abnormalities often lead to impairments in procedural learning. However, examining procedural learning in TS have produced contradictory results: Some studies have reported intact or even enhanced procedural learning, while others have found impairments. However, procedural learning is a multicomponent process and previous studies investigated only certain aspect of this mechanism. In this study, we investigated the implicit and explicit learning of sequences in children with TS and typically developing (TD) children using a probabilistic sequence learning task. These two processes of procedural learning could be selectively impaired in TS. We used the explicit version of the Alternating Serial Reaction Time (ASRT) task which enables us to measure both implicit and explicit sequence learning in parallel. According to our results, explicit sequence learning could be altered in TS as children with TS did not learn the

explicit sequence in the task while TD children did. Examining implicit learning, both groups showed similar sequence learning, indicating intact implicit sequence learning in TS. This is in line with those previous studies showing the relative strength of implicit sequence learning in TS. This subprocess of procedural learning plays an important role in the acquisition of several cognitive and motor skills, such as language learning and playing sports.

PC - 035 The acquisition of agglutinating morphology in Hungarian infants

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The aim of the current study was to find out when and how Hungarian babies start to decompose morphologically complex forms into a word root and its suffixes.
During the experiment, 15-month-old Hungarian infants were auditorily presented with Hungarian sentences containing a nonsense word (e.g.: púr) with the suffix –bAn 'in' (e.g.: púrban 'in the púr') (familiarization phase). In the test phase, children repetitively heard either the word root (e.g.: púr; familiar trials) or another nonsense word (e.g.: gál; novel trials). The Headturn Preference Procedure was used to measure looking times. Half of the babies completed the back vowel condition (word root and suffix with back vowels, e.g. púrban), the other half the front vowel condition (word root and suffix with front vowels, e.g. pérben). Infants looked longer to the familiarized word root than to the novel one in the back vowel condition, suggesting that infants are able to decompose complex forms containing this suffix at this age. A control experiment run on another group of babies showed that the preference did not appear due to the phonological similarity between the familiarized complex form and familiar trials. In the front vowel condition infants did not show a preference.
Our results suggest that morphological decomposition starts early in infants learning agglutinating languages, allowing word learning to proceed at a similar pace than in morphologically poorer languages. Furthermore, this ability is modulated by the frequency and of perceptual/productive salience of the suffixes involved, as the front/back asymmetry suggests.

PC.e - 036 How do infants encode unexpected events? Visually evoked neuronal rhythms may tell!

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Infants possess a core knowledge about their physical and social environment, which allows them to form predictions about regular events. Classically, Infants' predictions of events are measured by violation of expectation (VOE) responses, applying looking time paradigms or event-related neuronal responses in the EEG.

Here, using visually evoked neuronal oscillations, we aim to establish a novel procedure to assess infants' brain responses to unexpected events in the EEG and to elucidate the functional role of infants' alpha (~6 Hz) and theta (~4Hz) rhythm.
We will present 35 nine-month-old infants (N = 21; data collection is ongoing) with sequences demonstrating a physically or socially expected or unexpected outcome (e.g., a ball falling through a table), while flickering these sequences at infants' theta (4 Hz) or alpha (6 Hz) frequency (on and off frames of a CRT monitor). We will look at power differences in rhythmic response to the flickering stimuli at occipital electrodes (steady state visually evoked potentials; SSVEPs) and report our results regarding the hypotheses that there will be (1) power differences between the unexpected and the expected outcome and (2) an interaction between the outcome (expected vs. unexpected) with the driving frequency. That is, we expect higher SSVEPs for the unexpected outcome for the theta SSVEP, indicating an interaction with learning mechanisms, but higher alpha SSVEPs for the expected outcome, reflecting lower attentional resources.
SSVEPs may yield a robust way to measure infants' encoding of unexpected events and the functional role of neuronal rhythms in infants' learning.

PC.e - 037 How efficient are the beliefs about efficiency? The case of 3-year-olds in a tool use task

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Already in infancy, humans can track others' false beliefs regarding simple scenarios, when unknown for the character an object is moved to a new location. However, it remains unclear whether the representational apparatus responsible for the early developing belief tracking capacity can grasp contents with different complexity. In the current study, we investigated whether children were able to attribute beliefs about relational contents, in the current case, tool efficiency.
3 to 4-year-olds were familiarized with a set of inefficient and efficient tools operated by a character, such that the different tools had different causal contributions in obtaining a reward. During the false-belief condition, in the absence of the character, the efficient tool was replaced by an inefficient one, while in the true-belief condition this exchange took place in his presence. We tested whether children could represent false belief about the efficiency of the tools and integrate them in behavioral predictions.
We collected both implicit and explicit measures of false belief reasoning from every participant. Results (N=74) suggest that children tend to perform above chance regarding implicit measures in the true and false belief conditions. Furthermore, children's performance on the implicit and explicit measures were not different, those that passed one passed the other as well, suggesting that implicit and explicit ToM reasoning might recruit related mechanisms. Further positive findings on a follow-up study would indicate that young children, similarly to adults, can integrate various information in false belief reasoning.

PC - 038 Do children represent the future as in front of them?

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In common with many languages, English often employs spatial metaphors to talk about time. The future is typically represented as in front of speakers and the past as behind. Although research suggests that young children understand these spatial metaphors from age 5 it is not known whether spatial representations of time are spontaneously evoked by children in their everyday thinking about time. The issue is thrown into sharp relief by recent evidence suggesting that it is orientation to the future (or past) that conditions the mapping of time onto space rather than linguistic metaphors. Across two tasks we investigated the mapping of time onto space in children aged 6-to-7, 9-to-10, adolescents aged 14-15 years, and adults. In the first task participants listened to sentences describing past or future events and made speeded judgements on the tense of the sentences by sliding a lever either forward or backwards. In the second task participants made explicit space-time mappings using an overhead diagram of an avatar. Results indicated that older children and adults judged the future to be in front when asked explicitly, however, only adults showed evidence of spontaneously mapping time onto space in this way. We discuss these results in light of some recent claims that the representation of the future as in front leads to the subjective feeling of the future as closer to us than the equidistant past: a phenomena known as temporal distance asymmetry (Caruso et al., 2013).

PC - 039 The ontogeny of social touch: 9-month-olds' heart rate response to tactile stimulation varies depending on who they think is touching them

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Humans' sensitivity to social touch is likely to involve a class of unmyelinated afferents named C-tactile fibers. These fibers respond maximally to tactile stimulations having the thermo-mechanical properties of caresses (medium velocity and human skin's temperature). It has been argued that C-tactile fibers are part of a neuro-cognitive system whose function is to build and maintain social relationships. To test this hypothesis in infants, we capitalize on a previous study showing that 9-month-olds' heart rate decreases more in response to a stroke of medium —rather than slow or fast— velocity (Fairhurst et al., 2014). We test whether this physiological reaction is only determined by the tactile stimulations' mechanical properties, or whether it can be modulated by the relationship that infants have with the person touching them.

Nine-month-olds (N = 48) were stimulated by stroking them with a brush at three different velocities (slow: 0.3cm/s, medium: 3cm/s or fast: 30cm/s). We tricked infants into believing that the brush was manipulated either by their parent or by an unfamiliar experimenter. In fact, it was a second experimenter (blind to condition) who delivered the stimulation. Infants' heart rate decreased more when they believed their parent —rather than a stranger— stroked them, but only when the tactile stimulation had a medium velocity (thus activating C-tactile fibers maximally). In short, infants react differently to the exact same tactile stimulation depending on who they think is touching them. These results reveal that touch serves a social function from infancy on.

PC - 040 The ontogeny of tool innovation: Cognitive, social, and cultural processes

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In this study, we investigated cultural, cognitive and social-interactive processes implicated in tool innovation in Turkish and New Zealand preschoolers. We used Cutting et al.'s (2011) tool-making paradigm where 5-to-7-year-old children need to combine one short and one long stick to form a hook in order to obtain a sticker in a small bucket inside a tall bottle. In Study 1, Turkish children solved the tool innovation task either individually (n=27) or within a joint, dyadic setting (n=14 dyads). Children could get scores from 4 to 1 according to their success in one of three phases or in none of the phases, respectively: (Phase 1) Spontaneous tool innovation, (Phase 2) after demonstration of the ready-made tool, (Phase 3) after demonstration of the tool-making procedure. Subsequently, children performed a hierarchical-structuring task (Greenfield & Schneider, 1977), and a divergent thinking task (Guilford et al., 1978). Ordinal regression results showed that children in the joint group got higher innovation scores (p=.021). Hierarchical structuring complexity and divergent thinking were significant predictors of tool innovation (p=.0001, and p=001, respectively). In an explorative study (Study 2), the Turkish joint group from Study 1 was compared with a New Zealand joint group (n=16 dyads). Despite a phase-wise advantage of New Zealand children, tool innovation scores were not significantly different between the two groups (p=.41). Hierarchical complexity significantly predicted tool innovation scores (p=.046) but not divergent thinking (p=.69). These results indicate the significance of the role of dyadic interaction and individual cognitive differences in tool innovation across cultures.

PC - 041 The relationship between monitoring in executive functions and metacognition

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The two cognitive functions - "executive functions" (EF) and "metacognition" - (MC) are important for the development of children's self-regulating behavior and mental processes (Roebers, 2017). They share common theoretical features: controlled processes, self-regulated learning, similarities in development changes, and mechanisms of change (Roebers & Feurer, 2016). However, their interrelation has rarely been investigated. Monitoring is important for procedural metacognition

(Nelson & Narens, 1994), but what about monitoring in EF? “Post-error slowing” (PES), slowing down after realizing making an error, presents an empirical regularity (Rabbitt & Rodgers, 1977) but has been only very seldom been used in studies as a measurement of error detection in EF (Lyons & Zelazo, 2011). The aim of this study was to examine the relationship between PES and procedural metacognition as well as investigating their development trough years. This knowledge could be a step forward to bringing the two fields of higher order cognitive functions closer, by specifically looking at their monitoring. In our study we tested 30 children in two different age groups (middle and late elementary school). We assessed PES in executive functioning tasks (Simon task and Stroop task) by systematically comparing reaction times after committing an error with reaction times after correct responses. Procedural metacognition was measured by a paired associate learning task, with confidence judgments being used as monitoring measures. Preliminary findings suggest that there is an association between both monitoring processes (PES and procedural metacognition) in child development which highlight the relationship of EF and MC.

PC - 042 Beyond the Literal: Six-year-olds' flexible interpretations of pictures

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Drawings can represent more than one entity, and they can also represent literal or non-literal concepts associated with a referent. Our aim was to examine whether 6-year-olds can view iconic pictures as both literal and non-literal when they are presented with different contextual cues, which would indicate representational flexibility. The experimenter read aloud a brief story explaining children how a fictional character had created or used a picture in, for instance, a literal context (e.g. a girl used a picture of a crown to represent what she wanted for Christmas). After that, the correspondent picture was presented and children were asked “What does this mean?” The procedure was repeated with a second story of how the same artist produced or used an identical picture in a non-literal context (e.g. the same girl used the picture of a crown to represent what she wanted to be when she grew up). The order of presentation of the stories was counterbalanced. Nineteen 6-year-olds and 19 adults were tested. Our results showed that children and adults are representationally flexible in their interpretations of pictures across contexts, as both groups provided a literal and non-literal name for each picture. For children, the mean non-literal response was 87% when pictures were described non-literally and 13% when pictures were described literally; this did not differ from adult performance (chi-square, all ps>.05). Results are discussed in terms of intentionality, plurifunctionality, and development of a mature theory of pictures.

PC - 043 The influence of normative expectations on German and Indian children's prosocial behavior

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Cultural variation in prosocial behavior has been shown to emerge during middle childhood (Rochat et al., 2009; House et al., 2013; Blake et al., 2015) - possibly because children increasingly conform to the social norms of their societies as they leave their homes and join the wider community. The goal of the present study was to investigate whether middle childhood is a societally-common developmental period where children begin to conform to normative expectations about prosocial behaviour. We manipulated normative expectations by providing children with normative information about the correct behaviour (Blake et al., 2016; McAuliffe et al., 2017). This study presents developmental data from a collectivistic society (India) and an individualistic society (Germany), and is part of a larger cross-cultural project. Children aged 4-13 (Germany: N = 112; India: N = 156) from middle class families played a costly sharing game (1/1 vs. 2/0) with an anonymous partner. Children were randomly assigned to one of three conditions: they were told via video which option was normatively correct to choose (prosocial or selfish) or were given no normative information (control). Preliminary analyses show that in both societies normative information had an effect on children's choices of the fair option (1/1) in the predicted direction. This suggests that children from two diverse societies conform similarly to normative information.

PC - 044 Development of pre-decisional information search and choice behavior in a complex probabilistic decision environment

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The UN Convention on the Rights of children encourages adults to involve children in decision making, while recognizing that the level of a child`s participation in decisions must be appropriate to the child`s level of maturity. This postulation leads to the question of how the ability to make complex and even risky decisions develops over age and what cognitive abilities are necessary to master these decisions. To address these issues we confronted children (between the age of eight and twelve years) and adults with a child friendly computerized information board procedure to assess their strategic and adaptive pre-decisional information search and choice behavior in a complex probabilistic environment. Furthermore we measured children`s executive functions (inhibition, shifting, updating) and probabilistic thinking to identify potential cognitive abilities that foster decision making. Although even some eight year olds show first signs of strategic decision making and adaption of pre-decisional search by prioritizing the most important information. Our data suggests that the ability to meaningfully adapt pre-decisional search and choice behavior to the

complex decision environment develops slowly with age and is not fully developed up to the age of twelve years. Contrary to our expectation children`s executive functions do not seem to explain the developmental differences in decision making. Merely a higher level of probabilistic thinking appear to foster children`s search and choice behavior in the complex probabilistic decision environment.

PC - 045 The role of communication in guiding infants' social inferences

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It has been proposed that from early on language is used as a social marker of identity (Liberman et al., 2017). In the current study we investigate an alternative proposal; the role of communication in guiding infants' social inferences.
In three studies we present videos to 15-months-old infants adapting Martin et al. (2012)'s procedure. Studies-1&2 investigate whether infants expect foreign speech to transfer information from a Communicator to a Recipient when both speak the same foreign language (study-1), or when the Recipient speaks the infants' native language (study-2). Infants see first two video-clips where each individual introduce herself. Then, the Communicator appears alone and selectively grasps one of two objects (target). Next, the Recipient appears alone showing no preference by grasping both objects. In the test phase the two agents appear together and the Communicator can no longer reach the objects. She turns to the Recipient and speaks.
In study-1 we hypothesize that infants will expect unfamiliar speech to transfer information between individuals who share the same language. We predict participants to be more surprised when the Recipient brings the non-target object over the Communicator's face than when she handles the target one. Conversely, in study-2 we predict that participants will behave similarly when the Recipient handles either of the two objects.
As a control of study-2, in study-3 the Recipient knows the Communicator's preference and communication is not required to cooperate. We predict that infants will expect the Recipient to handle the target object rather than the non-target one.

PC - 046 Sense of body ownership in infancy

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Studies have demonstrated that the body ownership and awareness in adults can be manipulated by varying temporal and spatial properties of multisensory information using paradigms such as the „rubber hand illusion". However, it is not yet known whether infants are also sensitive to the sense of body ownership. To address this issue we measured looking time behavior of infants between 10 and 16 months. We presented video displays of lifelike baby doll hands touched by paintbrush, while

their own hand was also touched with the visual-tactile synchronous and asynchronous ways under conditions in which the visual information was either from a first-person perspective (hand looks belonging to the infant) is or third-person perspective (hand looks belonging to another person). We found that infants distinguished the synchronous condition from the asynchronous condition, but only when the visual stimulus was occurred in a first-person perspective. The results demonstrated that infants are able to detect multisensory synchrony when related to their own body properties, and they have sense of body-ownership for their hand.

PC.e - 047 Preverbal logic at work: logical reasoning supports infants' processing of others' preferences.

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The disjunctive syllogism (either a or b; not a; therefore, b) is a logical rule that generates expectations by pruning a space of hypotheses. Although logical representations have been extensively investigated in natural languages, empirical evidence bearing on the presence of logical abilities in preverbal infants was inconclusive. Here we investigate the precursors of logical concept, asking whether infants can deploy logical reasoning to disambiguate goal-directed-actions.
In a violation of expectation paradigm, 14-month-old infants were familiarized with a set of video-animations depicting a hand that repeatedly reached for one member of a pair of objects. Afterwards, infants were tested with new situations that had the following structure: first, the two objects were invisibly displaced with the help of two occluders, disrupting this way the spatial tracking of the target; then, we revealed the identity of the non-preferred object. At this point, infants could infer the identity of the invisible object using a disjunctive syllogism.
In Experiment 1 (N=24) the scenes with the hand grasping the non-preferred object triggered longer looks than the scenes with it grasping the concealed object. This result suggests that infants inferred the identity of the hidden object deductively and used this information to evaluate the consistency of the observed actions with the agent's preference. In Experiment 2 and 3 (N=24, each) we ruled out alternative explanations like encoding a negative attitude toward the competitor and the attribution of a preference for unknown objects.

PC - 048 Do 12-month-olds use the principle of compositionality to interpret complex noun phrases?

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The hallmark of the human thought is that we are able to productively and flexibly combine familiar concepts to derive an infinite number of new conceptual representations: simple ones (e.g., "green

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apple") or more complex ones (e.g., "the longest bridge in Budapest"). The principle of compositionality is at the heart of our language competence: the meaning of complex expressions (e.g., "green apple") is derived by the language users from the meaning of simple constituents (e.g., "green", "apple") and the structure of the expression. Here, we explore whether preverbal infants apply the principle of compositionality to compute the meaning of complex noun phrases.
In Experiment 1, using a looking-while-listening procedure (Swingley, 2002), we demonstrated that 12-month-olds were able to learn two distinct proto-numerals denoting a singleton and a pair.
In Experiment 2 (data collection ongoing), we are investigating whether infants are able to compose the meaning of these proto-numerals with the meaning of familiar kind labels. We expect that they would orient preferentially to the target satisfying the meaning of both constituents over the distractors satisfying the meaning of the constituents separately.
Our results will shed light not only on the developing cognitive mechanisms involved in the implementation of linguistic compositionality in a preverbal cognitive system, but also on the conceptual structures involved in the acquisition of number words.

PC - 049 Promoting toddlers' social cognition and prosocial behavior: a training study at nursery

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In the last decades, researchers have been interested in studying early prosocial behaviors and the factors that may impact on their development. Recent longitudinal and training studies suggest that socio-cognitive skills, such as empathy, theory of mind and emotion understanding are related to individual differences in children's prosocial behavior.
The aim of the study is to verify the effects of an empathy training - carried out by teachers at nursery school - to improve social understanding and prosocial skills in toddlers.
A total of sixty-four 22- to 36-month-olds (36 F; Mage=29,78; SD=3,97) took part to a pre-test/post-test quasi-experimental design. They were administered the Prosocial Tasks (PT) for assessing prosocial behavior and the Affect Knowledge Test (AKT) for emotion knowledge. Furthermore, parents completed the Child Prosocial Behavior Questionnaire (CPBQ) and the EmQue-I13, concerning toddlers' empathy and prosociality. All toddlers participated in an 8-weeks intervention in which teachers read emotion-based stories to small groups of children and then either involved them in conversations about emotions (EmoConv Group), in conversations about physic states (PhysConv Group) or in play activities (Play Group). Preliminary results showed a significant increase in prosocial abilities in the EmoConv Group, both in PT ($F(2,61)=8.664$, $p<.05$, $\eta p2 =.136$) and in CPBQ ($F(2,61)=5.098$, $p=.009$, $\eta p2 =.143$). Furthermore, the intervention fostered gains of cognitive empathy, such as AKT's score ($F(2,61)=14.521$, $p<.001$, $\eta p2=.323$) and EmQue-I13's score ($F(2,61)=2.957$, $p=.05$, $\eta p2=.088$). In conclusion, preliminary results of this study confirm the efficacy of conversational intervention in promoting toddlers' cognitive empathy and prosocial abilities.

PC - 050 Preschooler's information search and planning in a maze exploration task

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Being able to efficiently plan ahead is a crucial component of goal achievement at any level of complexity, from grocery shopping to building a career. This ability emerges during the preschool years. Although 3-year-olds already demonstrate rudimentary planning skills in a maze or a route planning task (e.g., Hudson & Fivush, 1991), most 5-year-olds still fail in tasks requiring more intermediate steps (Völter & Call, 2014). In this project, we explore 3- to 6-year-olds'(N = 180) planning abilities from a novel perspective, by developing an information search version of a maze task. Children have to move a reward through a symmetrical, hierarchically structured maze organised into three levels. There is only one way out of the maze, but all passages are concealed: To get the reward out, children have to pay one token to reveal whether a passage is open or blocked, thus eliciting their exploration strategies. We will further compare children's exploration strategies in this physical environment with their question-asking strategies in a structurally equivalent binary categorisation task, in which they have to identify a target monster from a set of eight candidate monsters by asking only yes/no questions (Ruggeri, Walker, Lombrozo, & Gopnik, 2017). This will allow us to computationally analyse children's physical exploration and planning strategies and to test how they may benefit from a spatial representation of the task's hypothesis space. Data collection is currently ongoing and will be completed in December 2017.

PC - 051 14-month-old human infants' understanding of others' false beliefs involving numerical identity mistakes

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False beliefs involving numerical identity mistakes can be of two broad types. Previously Kampis & Kovacs (in prep.) found that 14-month-old infants are sensitive to an agent falsely believing that two appearances indicate two different entities, when infants knew that in fact the two appearances belonged to the same entity. In the current study we presented infants with numerical identity mistakes of the reverse type: infants received information indicating that there are two objects in a scene, while another person believed there is one object only.
First, an experimenter (E1) showed the infants and another experimenter (E2) the content of a kinder-egg, which was then closed and put in a box. Subsequently they both saw that the (closed) egg was taken out. Then while E2 was present (True Belief trial - TB) or absent (False Belief trial - FB), but always visibly to the infant, the egg's content was revealed. Crucially, the egg's content was different than previously, suggesting that there were in fact two eggs. As a result, infants (and E1 in

TB) had reasons to believe an egg still remained in the box, whereas E2 in False Belief mistakenly thought the box was empty. We measured infants' search duration in TB and FB trials. We predict that if infants represent E2's belief in the two scenarios, and as previously found the other's belief modulates infants' own search duration, then infants should search less in FB trials. Preliminary data is in line with these predictions, data collection is ongoing.

PC - 052 The influence of social context features in social referencing – Conceptual accounts and a study idea

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In daily life, infants are often faced with ambiguous situations. Literature suggests that during these situations, infants usually increase their looking behaviour towards social partners (social referencing, SR). The 'situated cognition' framework claims that infants' SR varies with social context features, such as familiarity of social partner. Accounts about the functions of SR diverge in their predictions on how familiarity influences infants' SR. The classical information processing view assumes that infants watch others' behaviour in order to evaluate the ambiguous situation without specifying the influence of features of the social context. Social-cognitive accounts see social interaction partners rather as an additional target of infants' learning processes (in addition to the physical context). Hence, they assume that children need information about the other person in order to interpret others' behaviour regarding the ambiguous situation. Hence, social-cognitive accounts propose that SR decreases with increasing familiarity of the respective person, as they are more experienced in 'reading' intentions of a familiar person (familiarity hypothesis) and as there is less information to learn about familiar persons compared to strangers (novelty hypothesis). The co-regulation account similarly proposes an effect of familiarity, but in opposite direction. It stresses the SR's functional role for keeping arousal within optimal range during ambiguous situations (rather than merely gathering information about the physical and social context). Accordingly, SR should increase with familiarity of social partners as more competent co-regulators. Research that systematically contrasts these accounts in an ecological valid paradigm is lacking. A study for filling this gap is proposed.

PC - 053 Do children see angles and distances as different things?

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The concept of angle is central to Euclidean geometry: Euclid gives a definition for right angles at the opening of The Elements, and many of the ensuing theorems proceed to demonstrate properties of angles (e.g. "the sum of the angles of a triangle is equal to two rights"). Yet, children show many difficulties with angles: for example, infants fail to detect variations of angles when they detect

variations in length ratios; 4-year-olds judge angles by the overall size of a figure rather than by the aperture of its branches; and most strikingly, when estimating the missing angle of an incomplete triangle, 5- and 6-year-olds produce responses correlated to the length of the triangle base, instead of relying on the orientation of the truncated sides. Based on this last result, we hypothesized that children may initially represent angle figures solely in terms of the distance between branch ends. To evaluate this hypothesis, we created a task where we presented participants with puzzle pieces fitting either by angle or by distance, and asked them to evaluate the effect of various geometric transformations on the fit. We tested 131 children in 1st to 5th grade, and 24 adults. All groups gave different responses to the angle and distance puzzles, including 1st graders (age 7). These results indicate that concepts of distance and angle may start to diverge between the ages of 6 and 7 years; or alternatively, that our task reveals previously undetected differences between children's initial concepts of angle and distance.

PC.e - 054 Infants understand helping as reducing the cost of the helpee's action

Laura Schlingloff, Denis Tatone, Barbara Pomiechowska, Gergely Csibra
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From a young age, infants show a preference for helpful characters. This evaluative behavior is thought to reflect an early understanding of the act of helping; however, to date, not much is known about what this concept precisely entails. We investigated whether 12-month-olds (n = 24) expect a helper to act in a way that minimizes the action costs incurred by a helpee to realize her goal. In a violation-of-expectation paradigm with animated video stimuli, infants were familiarized with an agent approaching a goal object while an obstacle was blocking the most direct path to the goal. In half of the trials, the agent took a longer, costlier path; in the other half of the trials, the agent was assisted by a helper who removed the obstacle and thus reduced the agent's path length to the goal. At test, infants were presented with two different test events: the helper provided the helpee access to the goal via the shortest, most efficient path (consistent test) or via a longer path (inconsistent test). If infants understand that the goal of the helper's action during familiarization is to reduce the helpee's action costs, they should look longer at the inconsistent test event. As predicted, infants looked longer at the inconsistent outcome; however, this effect was significant only for those infants who were presented with the inconsistent test event first, confirming an additional order effect.

PC - 055 What narratives tell us about language in autism spectrum conditions

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Narratives are ecological means to elicit speech in clinical populations- both for assessing formal aspects of language as well as how language construes a shared reality of agents and events. Previous literature on narratives in autism spectrum conditions (ASC) shows that referential anomalies distinguish ASC children from other clinical groups like ADHD or typically-development (Banney et al. 2014; Rumpf et al. 2014) and may relate to ASC symptom severity (Suh et al. 2015). However, this previous work has not looked at reference fully systematically. Here, we catalogue referential constructions and errors though a linguistic lens and explore the relation between qualitative deficits in narratives and specific grammatical profiles. Fifteen children with high-functioning ASC (mean age: 8.6) and fifteen verbal-IQ matched controls participated in a storybook narration task. Narratives were transcribed and annotated for various grammatical constructions across nominal, verbal, and clausal domains as well as potential errors and rated for story completeness. Our results showed that our ASC population didn't differ from controls on errors (all $p \geq .325$). However, we found significant differences in the way the narratives were built- primarily with regard to a reduction of anaphoric devices ($p = .003$) and relative clauses ($p = .011$) in the ASC group. The proportional reduction of anaphora correlated to lower overall story completeness and quality across groups ($r = .514$; $p = .004$). These results show that even at the high-functioning end of the spectrum and controlling for verbal IQ, linguistic markers based on fine-grained grammatical measures can detect ASC against typically developing age-matched controls.

PC - 056 Normative learning of tool and non-tool actions

Angelique Eydam, Erika Nurmsoo

University of Kent, UK

Children interpret others' intentional actions as normative; after a demonstration of a game, children protest when a new party deviates from the rules (Schmidt et al., 2010). Natural Pedagogy states that taught actions are interpreted by the learner as being public and culturally shared (Csibra & Gergely, 2006). Children are sensitive to the cultural importance of tools; 18-month-olds imitate novel tool actions more often than novel body actions (Eydam, Leahy, & Nurmsoo, 2013). In the present work, we explore whether 3- to 5-year-olds treat tool actions more normatively than body actions, and interpret taught normative actions as culturally shared.

Children were shown how to activate two toys either using a novel tool, or by using the hand. After an imitation phase, their parent entered and performed the contrasting action. We recorded children's protest, attempts to teach, and subsequent imitation. To determine whether children considered the actions public knowledge, parents were either explicitly absent from the demonstration ("mum can't see us") or explicitly present ("mum's watching").

Children protested more when parents failed to use a demonstrated tool than when they used a tool instead of the demonstrated hand. They were equally likely to protest in the parent present as parent absent conditions. Interestingly, children were more likely to imitate the mistake tool action than the mistake hand action used by their parent, suggesting that they were not strict with themselves on following the norms, as long as tool use was involved.

PC - 057 Effects of adult-child interaction processes on learning and memory

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Pedagogical interaction processes between educator and child in institutional pre-school child care facilities are of particular importance for the cognitive development of children. Our research highlights the impact of Sustained Shared Thinking (SST) as one promising systematic interaction format to stimulate the social, emotional, linguistic and cognitive development of children in pre-school age. Our current study seeks to contribute to a better understanding of the underlying mechanisms of SST that promote cognitive achievement. Encoding of information and retrieval from memory are vital cognitive functions to characterize learning episodes in adult-child interaction. Therefore we address basic principles of SST as experimental manipulations of encoding strategies. In a newly developed memory-paradigm SST is operationalized and manipulated as the amount of shared epistemic status and the encouragement to further thinking in adult-child interaction. Preschool children aged between four and six years learned pictures and associated causal hypotheses in two conditions (learning with shared epistemic status vs. directional learning). Our prediction is that in the case of shared epistemic status, the exploratory behavior of the children and the generation of their own hypotheses is stimulated more strongly. As a result, given information can be deeper elaborated in the first condition, its distinctiveness to other memory contents can be increased and the congruence with individual experiences of the children can be favored. The consequences of an SST versus directional learning situation were therefore examined with regard to memory performance. We report initial findings and discuss the results from the perspective of consensual memory models.

POSTER SESSION C
SATURDAY

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MAPS AND RESTAURANTS

1. GOVINDA
Vigyázó Ferenc u. 4, 1051
Indian, Vegetarian

2. TRATTORIA POMO D'ORO
Arany János u. 9, 1051
Italian

3. BÖRZE
Nádor u. 23, 1051
Hungarian

4. TERV BISZTRÓ
Nádor u. 19, 1051
Hungarian

5. DELIBABA
Nádor u. 19, 1051
Soups, Sandwiches

6. ISTANBUL KEBAB
Október 6. u. 22, 1051
Hungarian, Turkish, Self-service, Fast food

7. SOUP/PASTA CULTURE
Október 6. u. 19, 1051
Soups, Sandwiches, Pasta

8. HUMMUSBAR
Október 6. u. 19, 1051
Middle Eastern

9. BAMBA MAHRA
Október 6. u. 6, 1051
Burger bar

10. PAD THAI WOKBAR
Október 6. u. 4, 1051
Asian, Fast food

11. BESTIA
Szent István tér 9, 1051
Fusion, Bistro

12. AKADEMIA ITALIA
Október 6. u. 6, 1051
Italian

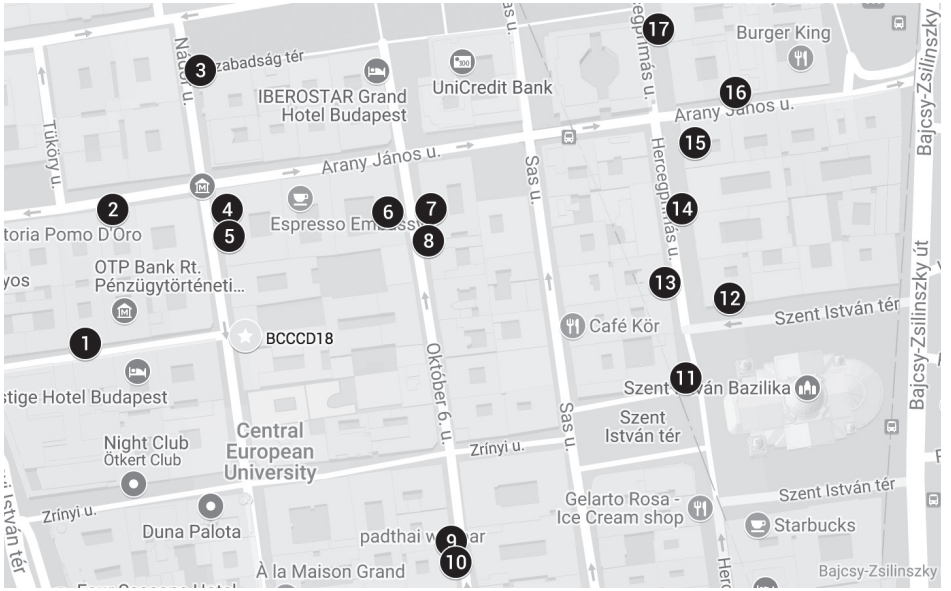
13. SALAD CONCEPT
Hercegprímás u. 12, 1051
Salad bar, Vegetarian

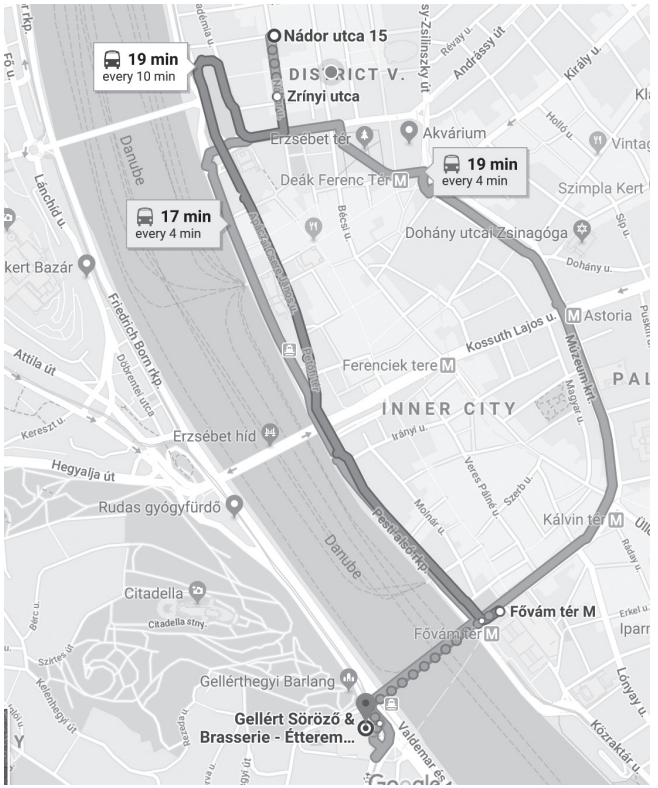
14. GUSTOLATO
Hercegprímás u. 13, 1051
Italian

15. CAFÉ VIAN
Hercegprímás u. 15, 1051
French, Hungarian

16. FRUCCOLA
Arany János u. 32, 1051
Salad bar, Sandwiches

17. KAMRA ÉTELBÁR
Hercegprímás u. 19, 1051
Hungarian, Self-service





Gellert Hotel
(the venue of the gala dinner)

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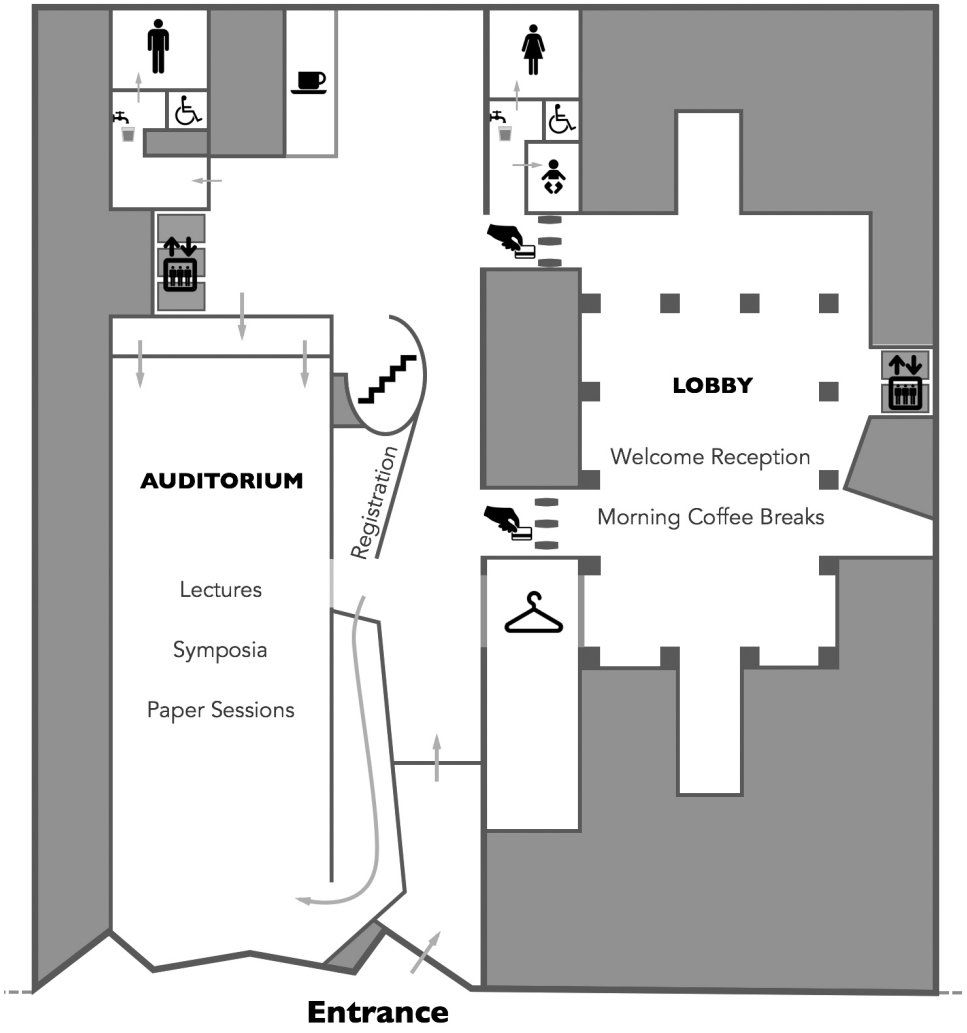
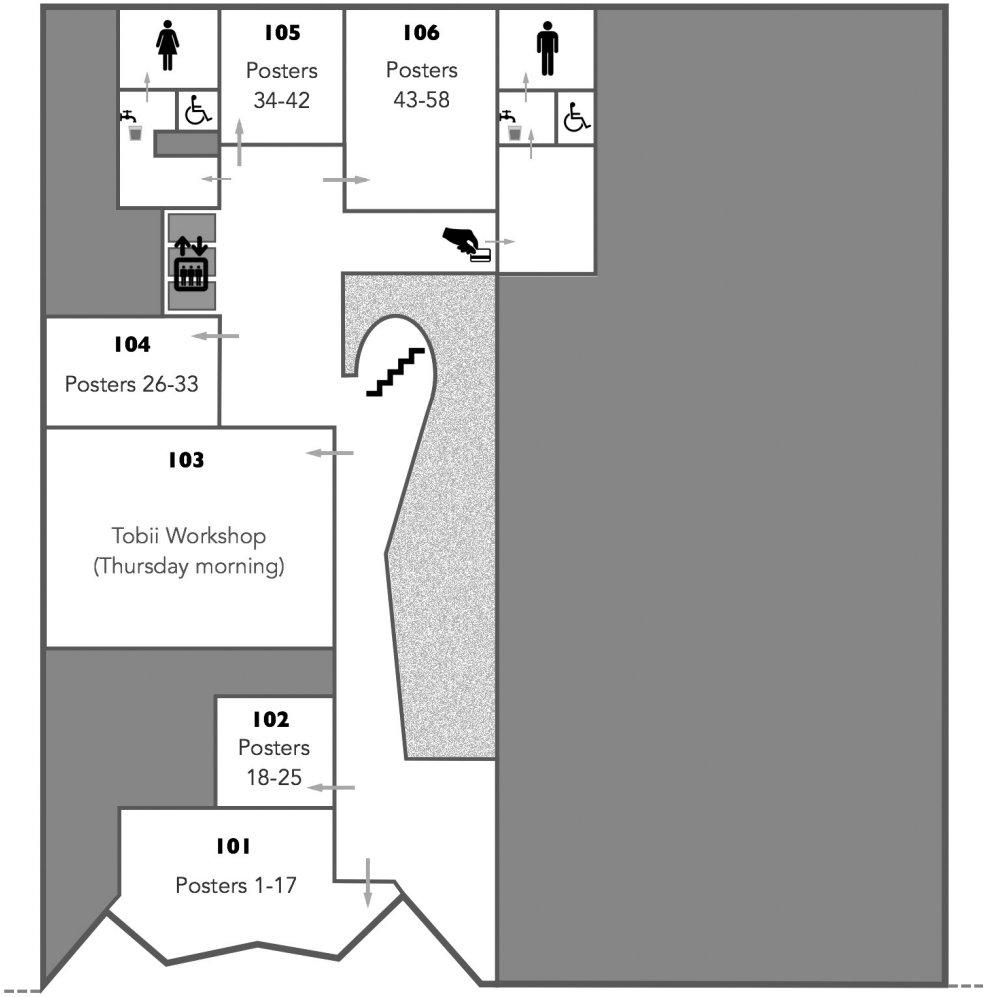
Ground Floor -- Talks



Nádor utca

First Floor -- Posters



Nádor utca

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