# BCCCD 2015

Budapest CEU Conference on Cognitive Development

## Program and Abstracts

CEU CENTRAL EUROPEAN UNIVERSITY

2015. BcccD

# BCCCD 2015

## Budapest CEU Conference on Cognitive Development

ORGANIZED BY THE

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Central European University

BUDAPEST

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The conference is organized by the Cognitive Development Center at CEU Cognitive Science Department

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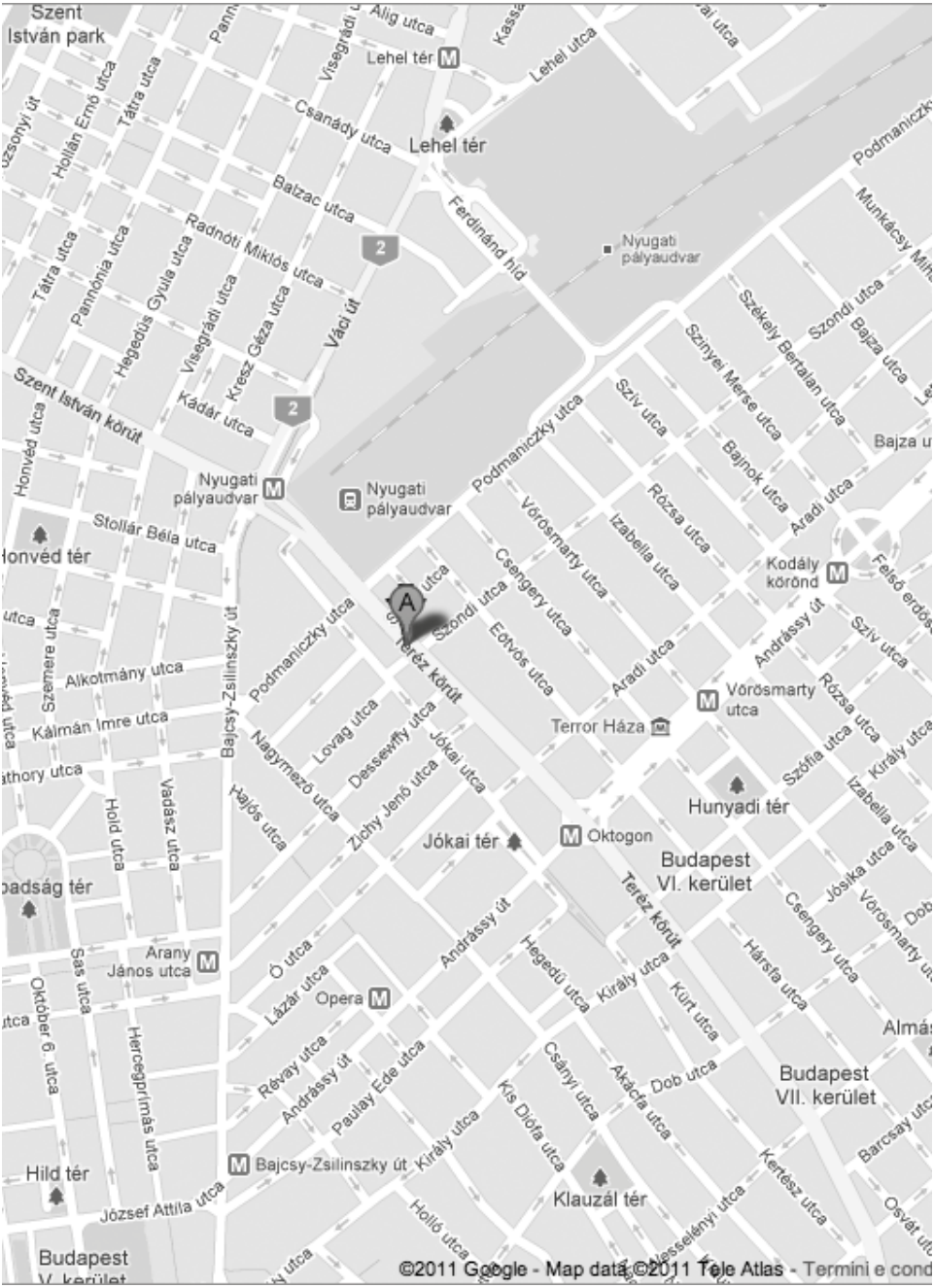

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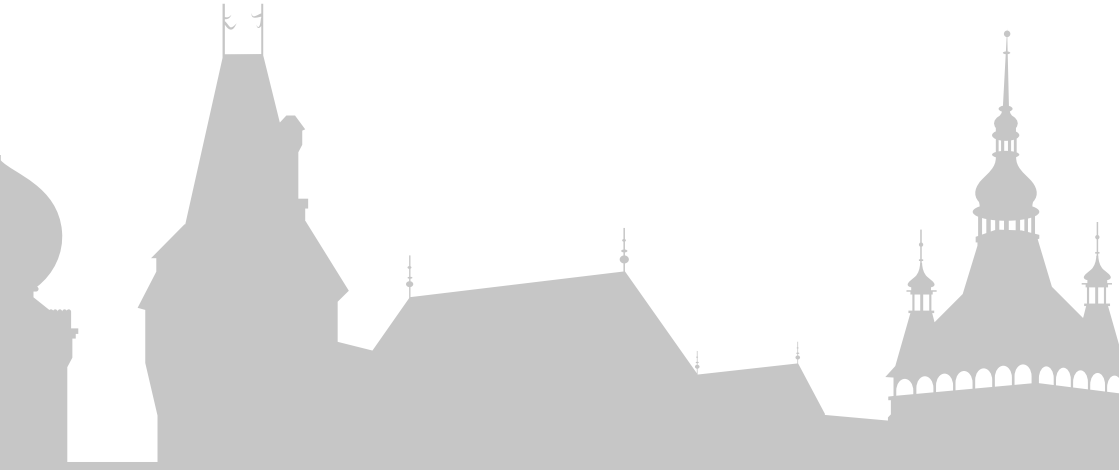

# SCHEDULE

**WEDNESDAY | JANUARY 07, 2015**

**16.00-20.00** **PRE-REGISTRATION**

**THURSDAY | JANUARY 08, 2015**

**08.00-19.00** **REGISTRATION**

## BCCCD15 PRE-CONFERENCE SESSIONS

**09.00-10.30** **TOBII PRESENTATION**

**10.30-11.00** **BREAK**

**11.00-13.00** **SMI WORKSHOP**

## BUDAPEST CEU CONFERENCE ON COGNITIVE DEVELOPMENT 2015

**14.15-14.30** **BCCCD15 WELCOME**

**14.30-16.30** **REGULAR SYMPOSIUM 1.**
Selective learning from others in infancy and toddlerhood

**16.30-18.00** **POSTER SESSION A WITH COFFEE AND SNACKS**

**18.00-19.15** **KEYNOTE LECTURE I.**
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**19.30** **RECEPTION**

**FRIDAY | JANUARY 09, 2015**

**08.00-17.00** **REGISTRATION**

**08.30-10.30** **REGULAR SYMPOSIUM 2.**
Interrelations between motor and social development in infancy and early childhood

**10.30-11.00** **COFFEE BREAK**

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|---|---|
| **11.00-13.00** | **PAPER SESSION 1.**<br>Theory of mind |
| **13.00-14.00** | **LUNCH BREAK** |
| **14.00-15.30** | **POSTER SESSION B WITH COFFEE AND SNACKS** |
| **15.30-18.00** | **INVITED SYMPOSIUM**<br>Symbolic representations: who has them and how are they acquired? Insights from human infants and chimpanzees, Patricia Ganea |
| **18.15-19.30** | **ICE SKATING SOCIAL EVENT** |

**SATURDAY | JANUARY 10, 2015**

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|---|---|
| **08.00-18.00** | **REGISTRATION** |
| **08.45-10.00** | **KEYNOTE LECTURE II.**<br>Core knowledge and conceptual change: The case of social cognition, Elizabeth Spelke |
| **10.00-10.30** | **COFFEE BREAK** |
| **10.30-12.30** | **PAPER SESSION 2.**<br>Reasoning |
| **12.30-13.30** | **LUNCH BREAK** |
| **13.30-15.30** | **REGULAR SYMPOSIUM 3.**<br>Ostensive and referential cueing in infancy |
| **15.30-17.00** | **POSTER SESSION C WITH COFFEE AND SNACKS** |
| **17.00-19.00** | **PAPER SESSION 3.**<br>Experimental pragmatics |
| **20.00** | **CONFERENCE DINNER** |

# KEYNOTE LECTURES

**KL1**

Brian Scholl
Yale University

# Core knowledge grows up

Our mental lives may be underwritten by 'core knowledge' -- mechanisms for processing information about specific domains that produce foundational 'primitive' representations, which then underlie many forms of higher-level representation and learning. Core knowledge has typically been explored in a developmental context, for example as a way of jumpstarting infants' learning about the world. Are such principles then later abandoned or revised in favor of more mature, flexible knowledge? Or might core knowledge continue to constrain our experience of the world into adulthood? Here I explore the latter possibility, focusing on ways in which core knowledge -- especially regarding object cognition -- fundamentally constrains adults' visual perception and attention. I will illustrate this approach with a few case studies, including (1) the role of spatiotemporal continuity and cohesion in mediating the representing of objects as persisting individuals, and (2) the role of 'event type' representations in directing visual attention to relevant features. In each case, work in infant cognition has led to new discoveries about how perception and attention operate in adulthood. This may be seen as an example of cognitive science in action -- of progress being made by bringing together traditionally separate methods and areas of inquiry.

**KL2**

Elizabeth Spelke
Harvard University

# Core knowledge and conceptual change: The case of social cognition

Mature human cognition is complex and variable, both across contemporary cultures and over human history, but human cognitive development proceeds in a more predictable pattern, especially in infants and young children. Studies of infants' cognitive abilities in non-social domains (including object cognition, numerical cognition and spatial cognition) shed light on the starting points for human cognitive development. Together with studies of these cognitive abilities in other animals, at other ages, and with other methods from the cognitive and brain sciences, this research suggests deep properties of physical and mathematical reasoning in older children and adults. Here I ask whether studies of infants can bring similar insights into human social cognition. Do the complex social inferences and intuitions of adults develop from, and build on, simpler systems that are functional in infants? If so, what are the properties of these systems, and what roles do they play in the richer social reasoning that emerges later in development? Recent studies of human infants, using simple behavioral methods, suggest that the answers to these questions may lie within reach. I describe some new findings and call for a multi-species, multi-leveled search for the core mechanisms by which humans navigate the social world.

# INVITED SYMPOSIUM

## IS1

# SYMBOLIC REPRESENTATIONS: WHO HAS THEM AND HOW ARE THEY ACQUIRED? INSIGHTS FROM HUMAN INFANTS AND CHIMPANZEES

Organizer:
Patricia Ganea, University of Toronto
Discussant:
Josef Perner, University of Salzburg
Speakers:
William Hopkins, Georgia State University & Yerkes National Primate Research Center
Melissa Allen, Lancaster University
Teodora Gliga, Centre for Brain and Cognitive Development, University of London
Patricia Ganea, University of Toronto

The ability to use symbols is considered a hallmark of human cognition. Symbols allow us to learn about an immense variety of topics that are not directly experienced. In recent years, an abundance of research has produced evidence regarding factors and mechanisms that support the development of symbolic thought. In this symposium the speakers will present recent work on symbolic development and will discuss questions relevant to current theories of representational development.

An important issue in the field is the extent to which humans' ability to understand symbolic communication is shared with other primates. The first speaker, William Hopkins, will argue that the reason great apes (and no other non-human primates) are capable of acquiring and using symbols for interspecies communication is because they respond to and initiate joint attention. He will also present evidence that the basic neurological system for language is present in great apes and that in humans this system developed further in terms of volume and connectivity. Melissa Allen will focus her discussion on children with Autism Spectrum Disorder (ASD) who are generally impaired in joint attention and who have difficulty understanding others as intentional beings. She will show that although ASD children's responses with pictures may appear symbolic, they rely on perceptual rather than conceptual processes to establish links between pictures and referents, compared to typically developing children.

Teodora Gliga will speak about measuring symbolic representations in infancy and about the functions that different types of object representations serve. She will discuss findings indicating that some of infants' object representations are symbolic (but not necessarily linguistic) and will present evidence for a dissociation in the neural substrate of symbolic and concrete representations. Patricia Ganea will present evidence indicating that the ability to understand reference to absent objects and to manipulate representations of such objects on the basis of verbal input is constrained by representational factors. She will interpret the evidence within the theoretical paradigm of mental files and will explore the question of when verbal updating of mental representations can occur in development. Our discussant, Josef Perner will present an insightful analysis of the issues presented by the speakers and raise questions for further discussion.

**IS1-01**

# The neural and cognitive foundation of joint attention in apes: Implications for the evolution of language and speech

William Hopkins
Georgia State University & Yerkes National Primate Research Center

It has been well documented in humans that, beginning around 6 months of age, receptive and subsequently initiating joint attention (JA), emerges prior to the onset of language. A number of studies have shown that JA abilities as early as 9 month of age can predict subsequent language development at 24 to 30 months of age. JA is not unique to humans. There is compelling evidence that all great apes (bonobos, chimpanzees, gorillas and orangutans) engage in at least some aspects of receptive and initiation in JA. In this presentation, I summarize what we know about JA in great apes and humans and discuss the similarities and differences in their function and use. Additionally, I will present data on the role of genetic and non-genetic factors on JA in chimpanzees. Specifically, I present data on the influence of rearing chimpanzees in human socio-linguistic environments on their JA abilities. Moreover, I will discuss recent findings on the heritability in JA abilities in chimpanzees and the potential role of the neuropeptides, oxytocin and vasopressin, on individual variation. Lastly, I present data on neuroanatomical correlates of JA abilities of chimpanzees within the context of the neuropsychological model proposed by Mundy and Newell in developing human children. In the discussion, I focus on the interplay between the evolution of JA and the brain and how these relate to the emergence of human language in modern humans.

**IS1-02**

# Symbolic understanding of pictures in typical development and autism: Divergent pathways?

Melissa Allen
Lancaster University

Typically developing children understand that pictures are symbolic and can refer to real world entities by the second year of life. Two fundamental questions that follow from prior work concern how young children form such symbolic relations, and whether these processes differ in individuals with socio-communicative impairment, specifically, Autism Spectrum Disorder (ASD). Here I examine whether symbolic understanding of pictures is mediated by iconicity, language, or referential intent in both populations. In Experiment 1, participants were taught novel words paired with unfamiliar pictures that varied in iconicity (black-and-white line drawings, greyscale photographs, color line drawings, color photographs). Unlike mental-age matched typically developing peers, children with ASD generally mapped words onto pictures rather than depicted referents, suggesting they form associative rather than symbolic relations. However, they generalized labels more frequently when pictures were colored, suggesting iconicity may facilitate symbolic understanding in this group. In Experiment 2, children with ASD categorized a line drawing with its referent, rather than another picture, regardless of whether it was named, whereas typically developing children only viewed pictures as symbols when they were labelled. Finally, Experiment 3 showed that, in contrast to typically developing children, children with ASD failed to link ambiguous pictures to their appropriate referents when referential intent monitoring is required. Overall, these findings suggest that typically developing children form an intentional theory of pictures, and children with ASD instead base pictorial understanding on realism and perceptual resemblance.

**IS1-03**

# Measuring symbolic representations in infancy

Teodora Gliga

Centre for Brain and Cognitive Development, University of London

In this talk I will bring experimental evidence that, around their first birthday, infants have different types of object representations that some of these representations might be symbolic (i.e. category placeholders), but not necessarily linguistic, and that non-linguistic symbolic representations are useful for storing information and learning one's first words. A first study will show that acquiring category representations modulates the way infants perceive and encode object properties in short-term memory. Eleven-month-olds could only detect changes in category irrelevant features when tracking through occlusion unfamiliar objects, but not objects they recognized as exemplars of known categories. This apparent "loss of ability" is likely to be a useful heuristic for more efficient information storage. Follow-up analysis of EEG oscillatory activity recorded during the hiding events suggests an anterior-posterior dissociation in the neural substrate of symbolic and concrete representations, which parallels what we know from imaging data in adults and cell recordings in other species. While being out of view, unfamiliar objects evoked posterior high-frequency activity while known categories were associated with anterior alpha-band activity. A second study will demonstrate gains in learning following the acquisition of category representations. Fourteen-month olds were presented with exemplars of two novel categories, either in a way conducive with learning the category structure (Category learning group) or not (Familiarization group). One exemplar of each category was subsequently labeled. In a looking-while listening-test, only infants in the Category learning group generalized the newly learned word to other category members. We interpret this to mean that word learning builds on pre-existing non-linguistic category representations.

**IS1-04**

# Updating knowledge about absent objects as mental file management

Patricia Ganea
University of Toronto

The use of language to describe absent objects and to manipulate their mental representations is a critical feature of language (Hockett, 1960). Recent findings indicate representational constraints on children's ability to respond to references to absent objects and to update their representations of such objects on the basis of verbal input (Ganea & Saylor, 2013). Here I will integrate this research with the theoretical paradigm of mental files (Perner & Leahy, in press; Recanati, 2012). Mental files are representations of individual objects, but the contents of such files can vary, from exclusively perceptual to predominantly conceptual. The perceptual files are sensory specific and have as an essential component the acquaintance relation that the subject has with that object. But as repositories of information about individual objects, mental files can be extremely sophisticated, ultimately incorporating definite descriptions that individuate an object as the unique bearer of certain properties and also different perspectives as when the subject considers someone else's thought. The management of such files is logically and pragmatically complex. There are several questions that I will examine from this perspective. What are the properties of files that children have available for objects that are not perceptually accessible? What does an update of a mental file consist in? A conservative update of a file simply extends the list of properties and relations in it. A revision update involves the elimination of some of these properties and relations and their replacement with incompatible properties and relations. When are children able to operate such revisions thorough inference?

# REGULAR SYMPOSIA

## RS1

# SELECTIVE LEARNING FROM OTHERS IN INFANCY AND TODDLERHOOD

Organizer :
Kristen Swan Tummeltshammer, CBCD, Birkbeck, University of London
Discussant:
Paul L. Harris, Graduate School of Education, Harvard University, Cambridge, MA.

Young children rely on others' testimony to learn most unobservable and culturally-specific knowledge, and already by age 2, they assert beliefs based solely on the information they've acquired from others (Harris, 2012). This has lead to the suggestion that children may have an early developing bias to trust what others tell them (e.g., Jaswal, Croft, Setia, & Cole, 2010). However, until very recently, children's "trust in testimony" has not been studied from a developmental perspective. This syposium will present research from infants and toddlers, using three different selective learning paradigms, and argue that even very young children are judicious in accepting (and soliciting) information from others. Extensive research using verbal testimony has demonstrated that preschool children are indeed selective in who they learn from. Preschoolers evaluate past accuracy, and use cues such as epistemic knowledge and group membership to infer whether an informant is trustworthy (Kinzler, Corriveau, & Harris, 2011; Koenig, Clement, & Harris, 2004; Koenig & Woodward, 2010; Sabbagh & Baldwin, 2001). Considerably less evidence has been gathered from infants and toddlers. Fourteen-month-olds will follow eye-gaze cues and 16-month-olds will point more in the presence of adults who have correctly identified the locations or labels of objects (Begus & Southgate, 2012; Chow, Poulin-Dubois, & Lewis, 2008). Fourteen-month-olds also choose to imitate actors differently, based on that actor's demonstrative knowledge of an object's function or conventional usage (Poulin-Dubois, Brooker, & Polonia, 2011; Zmyi, Buttelmann, Carpenter, & Daum, 2010). While these studies indicate that selective learning from others may be early-emerging, the developmental trajectory remains underspecified.

In this symposium, Kristen Tummeltshammer will present eye-tracking data from 5-, 8- and 12-month-olds, showing how infants selectively follow the gaze of reliable, rather than unreliable lookers. Katarina Begus will present an EEG study with 11-month-olds investigating the neural mechanisms that underlie selective learning when infants

are addressed by knowledgeable or unknowledgeable speakers. David Buttelmann will present data from a selective imitation paradigm with 14- and 18-month-olds, contrasting group membership cues with competency cues to consider how they are weighted in selective learning. In his recent reviews, Paul Harris has argued that children are remarkably discriminating in their use of others' shared knowledge, and that even infants understand how testimony works (Harris, 2012; Harris & Lane, 2013). As our discussant, Harris will integrate evidence from the three talks with existing literature on selective learning from others to provide a comprehensive developmental perspective.

**RS1-01**

# Selective gaze following across the first postnatal year

Kristen Swan Tummeltshammer [1], David M. Sobel [2], Natasha Z. Kirkham [1]

[1] CBCD, Birkbeck, University of London

[2] Dept. of Cognitive, Linguistic, & Psychological Sciences, Brown University

The direction of others' gaze can guide attention to socially relevant objects, locations, and events. Do infants orient selectively to others' gaze, and how does selective gaze-following develop? In an eye-tracking study, 5-, 8- and 13-month-old infants were familiarized with one face that reliably predicted (100%) where animations would appear and another face that unreliably predicted (25%) the animations' locations. We measured whether infants would search longer in boxes cued by the two faces when no animations appeared. Results showed evidence of selective gaze-following, as infants searched longer in the box cued by the reliable face, but searched randomly when cued by the unreliable face (significant Reliability x Box interaction). Comparisons across the three age groups indicate that selective gaze-following undergoes significant development in the first year. Five-month-olds followed only reliable faces to previously cued boxes (significant Reliability x Box interaction), but did not generalize selectively to novel boxes. Eight-month-olds followed only reliable faces to both previously cued and novel boxes (both significant Reliability x Box interactions). Thirteen-month-olds followed both reliable and unreliable faces to both previously cued and novel boxes (both significant effects of Box, no interactions). Finally, social referencing (i.e., how often infants looked back to the face) was positively correlated with selectively following the reliable face in all age groups ($r=0.42$, $p=0.009$). These results suggest that infants become more expert and automatic gaze followers over their first year as they discover and reference the predictive relationship between others' gaze and events in the world.

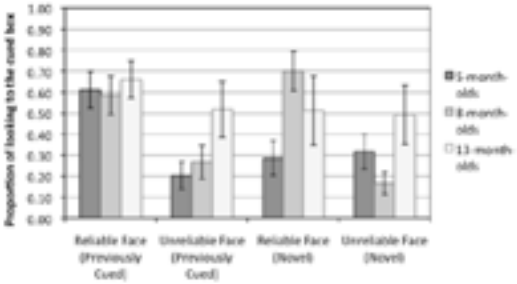


**Figure 1. Proportions of looking to cued box on reliably and unreliably cued test trials. Chance looking is 25%.**

**RS1-02**

# Infants seek information and prepare to learn only from informative adults

Katarina Begus, Teodora Gliga, Victoria Southgate
CBCD, Birkbeck, University of London

Infants are selective in what they attend to (Smith, et al., 2011), whose gaze they follow (Chow, et al., 2008), and whose actions they imitate (Zmyj, et al., 2010). Our previous work has shown that infants not only selectively follow, but also selectively solicit information based on reliability of the adults they interact with. Infants pointed to novel objects more when interacting with a knowledgeable than an ignorant adult, therefore only expressed interest when the adult was able to provide them with reliable information (Begus & Southgate, 2013). Based on this, we further explored whether infants invest their cognitive resources differently based on availability of usable information. As a potential marker of cognitive engagement in infants, we chose to study theta oscillations, which were shown to directly predict the rate of recall in adults (Guderian, et al., 2007), reflecting a strategic preparatory state in anticipation of receiving information. We familiarized 11-month-olds with two adults, one informative and one uninformative, but equally engaging. We observed increased theta oscillations when infants were addressed by the informative compared to the non-informative person ($t=4.365$, $p=0.001$). We are currently collecting data on two further conditions, one comparing a knowledgeable and an ignorant informant, and another contrasting a native and a foreign-language speaker. These will further clarify whether this frequency band plays the same role of preparedness for learning in infants' brain as it does in adults, and whether infants prepare themselves for encoding of information selectively based on reliability of the information source.

**RS1-03**

# Changes in the influence of a model's characteristics on infant social learning in the second year

David Buttelmann[1], Norbert Zmyj[2]

[1] University of Erfurt

[2] Ruhr-Universität Bochum

In their second year of life, infants are more likely to learn from competent or in-group models than from incompetent or out-group models. However, so far these cues to a model's reliability have only been investigated in separation in infancy. We investigated whether 14- and 18-month-olds (N = 131) would imitate and adopt preferences selectively from competent but out-group compared with incompetent but in-group models. Infants watched a series of videos in which an adult told short stories in a foreign or infants' native language and acted – competently of incompetently – on familiar objects. The adult then demonstrated a novel action (imitation task), and chose one of two objects (preference task). For infants' imitative responses there was a statistically significant three-way interaction between the variables of condition, age, and gender, $F(1,121)=7.38$, $p=.008$. This interaction was a result of several differences between groups. Most importantly, 14-month-old girls were more likely to imitate the competent out-group model than the incompetent in-group model, and 18-month-old girls imitated the incompetent in-group model more often than did 14-month-old girls. Fourteen-month-old boys and 18-month-olds boys and girls did not differentiate between conditions. For the preference task there was a statistically significant two-way interaction between the variables condition and gender, $F(1,121)=5.21$, $p=.024$. Boys adopted the model's preference more often in the competent/out-group condition than in the incompetent/in-group condition and more frequently than girls in the competent/out-group condition. These results suggest changes in the function imitation serves in early childhood and differences in in-group bias between boys and girls.

## RS2

# INTERRELATIONS BETWEEN MOTOR AND SOCIAL DEVELOPMENT IN INFANCY AND EARLY CHILDHOOD

Organizers:

Bahar Tuncgenc, Institute of Cognitive and Evolutionary Anthropology, University of Oxford

Discussant:

Markus Paulus, Fakultät für Psychologie und Pädagogik, Entwicklungspsychologie und Pädagogische Psychologie, Ludwig-Maximilians-Universität

The last couple of decades in cognitive development, neuroscience and behavioural sciences witnessed an increased interest in the relations between motor and social development (Prinz, Beisert & Herwig, 2013). Only through investigating their interplay will it be possible to reach a thorough understanding of social, cognitive and motor development (e.g. Hunnius & Bekkering, 2014). From very early ages onwards, children show a remarkable capacity to adapt to the complexities of the social world. Even before starting to use language effectively, infants begin to learn how to assign goals, understand other people's intentions and engage in joint actions with them in various ways (e.g. Csibra, Biró, Koós & Gergely, 2002; Southgate, Johnson, El Karoui & Csibra, 2010; Tomasello, Carpenter, Call, Behne & Moll, 2005). Arguably, infants' developing understanding of the physical world and motor capacities are crucial for advancements in the social domain. For instance, through exploring and manipulating the objects around them, young infants learn how to reach their desired end-states as well as anticipate other people's goals (e.g. Adolph & Berger, 2005). Moreover, infants as young as a 4 months old distinguish between sounds that follow different rhythms (Trehub & Hannon, 2006) and start moving their bodies rhythmically at 5 months of age (Zentner & Eerola, 2010). Despite being largely unknown, neural coupling between action observation and action execution processes might account for how motor skills permeate through the social domain (Lepage & Théoret, 2007). This symposium aims to underline the interactions among motoric, social and cognitive capacities during infancy and early childhood. The first speaker (Janna Gottwald, Uppsala University) will talk about how 14-month-old infants use visual, sensorimotor and social information as they prospectively plan their lifting actions and adapt to different object properties. The second talk (Marlene Meyer, Donders Institute for Brain, Cognition and Behavior) will focus on the flexibility of the neural motor system in processing other social beings and

their actions in early childhood. The last talk (Bahar Tuncgenc, University of Oxford) will present data on how highly-coordinated movements (i.e., movements synchronised in timing) guide the preferences and prosocial behaviours of infants and young children. The symposium will close with a discussion led by Markus Paulus (Ludwig Maximilians University Munich), where stimulating questions for future research will be highlighted.

**RS2-01**

# Infants' prospective planning during object manipulation

Janna M. Gottwald [1], Claes von Hofsten [1], Sabine Hunnius [2], Marlene Meyer [2], Gustaf Gredebäck [1]

[1] Uppsala Child & Baby Lab, Department of Psychology, Uppsala University

[2] Radboud University Nijmegen, Donders Institute for Brain, Cognition and Behaviour, Centre for Cognition

Infants start interacting with the world at very young ages by acting on and manipulating objects. To successfully manipulate objects, it is essential to infer their properties, such as their weight. Infants use different strategies to plan lifting objects prospectively (Forssberg et al., 1992; Mash, 2007). In two studies, we investigated how infants make use of object-related (Study 1) and social cues (Study 2) to guide their subsequent behaviour as they perform lifting actions. We present motion-tracking data, where infants lifted differently-weighted objects, which either looked alike or differed in colour. Lifting amplitude of the 1st movement unit (von Hofsten, 1991) served as the indicator for infants' prospective motor planning. Study 1 (n= 30) demonstrated that 14-month-olds use visual and sensorimotor cues to prospectively plan their actions. All infants lifted the objects weight-specifically, regardless of whether prior visual information on weight (indicated by colour) was provided. Yet, the effect was more accentuated for infants who had this prior information ($F(1,28)=5.76$, $p=.023$), indicating that visual information is used for prospective planning. Absence of prior visual information might heighten the sensitivity to sensorimotor information during initial contact with the objects. In addition to the information provided by the object itself and by the interaction with the object, important information can be gained from observing others' kinematics. In Study 2 (n=24), infants lifted similar-looking objects of different weights after either having or not having seen another person lifting them. Preliminary results for this study will be presented.

**RS2-02**

# Context-dependent processing of other's actions in early childhood: The flexibility of the neural motor system

Marlene Meyer, Hinke Endedijk, Harold Bekkering, Sabine Hunnius

Radboud University Nijmegen, Donders Institute for Brain, Cognition and Behaviour, Centre for Cognition

Converging evidence shows that the neural motor system of children is active during production of own and perception of others' actions (Marshall & Meltzoff, 2011). Moreover, in adults the motor system responds flexibly to different (social) situations; neural activation during action observation is enhanced when the observed actions are relevant for one's own subsequent behaviour (Grèzes et al., 1999). Yet, it remains unclear, how flexible young children are in their processing of others' actions. In an EEG study with 3-year-old children, we previously found that being actively engaged in a joint action enhances motor activation for processing others' actions. Observing someone's actions is also especially important for one's own actions during imitation contexts. Saby and colleagues (2012) found that 14-month-olds show more motor activity when being imitated, still, it is unclear how children process actions they are about to imitate. To better understand the flexibility of children's motor system, we conducted an EEG study with 4-year-olds in which we directly manipulated the relevance of the observed actions for children's subsequent behaviour. We measured their brain activity during action observation. In addition, each observed action was preceded by the instruction either 1) to imitate the observed action afterwards or 2) to later name the colour of the toy manipulated in the observed action. Results reveal stronger motor activation when children observed an action they were to imitate subsequently. Together, this suggests that young children flexibly process others' actions depending on the relevance of the observed actions for their own behaviour.

**RS2-03**

# Social influences of action synchrony in young children

Bahar Tuncgenc [1], Emma Cohen [1], Christine Fawcett [2]

[1] Institute of Cognitive and Evolutionary Anthropology, University of Oxford

[2] Department of Psychology, Uppsala University, Sweden

Joint actions, where participants synchronise the timing of their actions, are an essential part of human life. Examples for such actions can be found in contexts of armies, rituals, children's group play and dance. Research on action synchrony shows not only that adults spontaneously fall into synchrony with one another (e.g., Schmidt & O'Brien, 1997; Richardson, Marsh & Schmidt, 2005), but that action synchrony facilitates liking (e.g., Miles, Nind & Macrae, 2009), trust (Launay, Dean & Bailes, 2012) and cooperation (e.g., Wiltermuth & Heath, 2009; Reddish, Bulbulia & Fischer, 2012) among participants. Given these social outcomes, recognising and establishing synchrony may also be important for pro-sociality early in life. One recent study shows that 14-month-olds help an adult more after being bounced synchronously with them (Cirelli, Einarson & Trainor, 2014). Further, 4-year-olds help each other more upon engaging in joint music making (Kirschner & Tomasello, 2010). Following from there, we investigated whether action synchrony facilitates pro-sociality in infancy and early childhood. We found out that 12-month-olds (Study 1, n=40) preferred synchronously-moving partners to non-synchronous ones exclusively in a social context. 9-month-olds (Study 2, n=41) did not display preferences for synchronous entities in either social or non-social contexts. At present (Study 3), we are investigating whether 5-year-olds help their peers more upon moving synchronously with them. Preliminary results support this idea ($X2$ (2, N=22)=12.12, p=.002). Altogether, our results suggest that matching the timing of one's actions might be an important factor informing prosocial behaviour in early childhood.

## RS3

# OSTENSIVE AND REFERENTIAL CUEING IN INFANCY

Organizer:
Hanna Marno, International School for Advanced Studies - SISSA, Trieste, Italy
Discussant:
Teresa Farroni, University of Padova, Italy

One way of learning is to acquire knowledge from conspecifics, and to obtain new information via teaching situations. Teaching can occur either by transmitting explicit verbal messages, or by providing non-verbal ostensive and referential cues. This latter mechanism can be especially helpful in the case of preverbal infants, who are not able to understand yet the meaning of their language. Conversely, non-verbal ostensive and referential cues also play a very important role during language acquisition of infants (Kuhl, 2007). This symposium aims to discuss the origins and the effect mechanisms of ostensive-referential cues by providing new results in a broad spectrum. The first talk investigates how referential labeling of objects can influence more perceptual processes, like speech discrimination. In their studies, the authors manipulated referential cues in the labeling contexts to show how these cues can influence perceptual learning of speech sounds. Their results suggest an emerging referential awareness: by about 9 months of age, infants learn that if different words are labeled, then the acoustic distinction between those labels might be a useful cue in their native language. The second talk takes a step forward to study the origins of language acquisition by asking whether infants from a very early age would already appreciate the referential nature of language, and without knowing the actual meanings of words they would understand that labels refer to other entities in the world. In their studies the authors combined different speech and no speech sounds with another cue, the eye-gaze of the speaker to see which cues are able to elicit referential expectation of infants. Their results suggest that already 4-month-old infants expect to find a referent when they hear speech, but only if the speaker also provides a referential eye-gaze. Eye-gaze is a very powerful cue in directing infants' attention and studies gave evidence that even newborns can distinguish between eye-gazes that are either directed toward them or averted from them (Farroni et. al, 2002). Furhermore, infants at the age of 8 months interpret eye-gaze as a communicative act, and gazing can elicit their referential expectation in the direction of the gaze (Csibra &Volein, 2008). The last talk investigates the very basic mechanisms behind early competence in analyzing gaze direction. In their study the authors show that the extraction of dynamic directional information from ambiguous stimuli is biased by eye-

like contrast polarity even outside the context of a human face template. The fact that the presence of communicative signals contributes to this bias in young infants is consistent with the findings about the role of ostension in gaze-direction processing and suggests that dynamic directional signals, such as eye gaze, play a potential communicative-referential role in early development. Together, this symposium provides new insights into the origins and effects of ostensive-referential cueing in infancy. By discussing the perceptual mechanisms, as well as the function of ostensive-referential cues during language acquisition, we hope to contribute to a deeper understanding of learning processes in preverbal infants.

**RS3-01**

# How labeling objects induces phonetic learning in 9 to 10-month-olds

Henny Yeung
Laboratoire Psychologie de la Perception (LPP), CNRS & Université Paris Descartes, Paris.

Infants learn many of the phonetic patterns of their native language in the first 12 months of life. The phenomenon is likely to be driven, at least in part, by statistical learning mechanisms, as infants can learn distributional patterns of acoustic information from just auditory speech itself. Here I describe another kind of phonetic learning that depends on the rich multisensory environment that infants are exposed to, and in particular on the kinds of ostensive and referential object labeling that parents commonly make when speaking with their infants. Three laboratory studies are discussed, which ask whether 9- to 10-mointh-old infants can learn a novel phonetic category (e.g., a dental-retroflex contrast, a lexical tone contrast, and a trochaic-iambic stress contrast) from seeing objects labeled. The first study simply asks whether object labeling presents an associative cue: If Object X is given Label A, and Object Y is given Label B, does this increase the perceptual distance between Labels A and B? The second study further asks whether the referential nature of this kind of labeling matters: How does phonetic learning differ when Labels A and B occur in non-referential versus referential contexts? The third study asks whether object labeling is powerful: Will learning about the difference between Labels A and B generalize to new acoustic contexts? Overall, results suggest various ways that object labeling could assist with phonetic learning in infancy. Together, this work suggests ways in which ostensive and social parent-child interactions can shape infants' perceptual processing of speech sounds.

**RS3-02**

# Evidence of understanding referentiality of human speech in 4-month-old infants

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There is growing evidence that infants are born with a unique interest and sensitivity to process human language. For example, newborns are able to distinguish languages based on their rhythmical characteristics (Mehler et al., 1988) and to detect acoustic cues that signal word boundaries (Christophe et al., 1994). But from when they start to understand that language is a referential symbol system, is still unknown. In the present study we addressed this questions. Thirty, 4-months old infants were shown videos of a female face, who was either talking in a normal way, or in a backward way, or she was silently moving her lips. After each movie the face disappeared and either on the left side or on the right side of the screen an object appeared. Results gave evidence that infants' looked faster at the object in the normal speech condition than in the backward speech and silent condition. Furthermore, a second experiment showed that the eye-gaze of the speaker played a modulatory role in eliciting infants' referential expectation about language. These results support the hypothesis that infants do not only possess great speech-processing abilities, but they also have referential expectations about language, and in the presence of speech and a referential eye-gaze of the speaker they are ready to search for possible referents, at least from 4 months age old.

**RS3-03**

# Six-months-old infants rely on eye-like contrast-polarity to derive direction from ambiguous motion in communicative context

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The contrast relation typical for the human eye is that of a dark element (i.e., the iris/pupil) set against lighter background (i.e. the sclera). Numerous studies documented the importance of this eye-like contrast polarity for face processing in human adults, infants and newborns, as well as for gaze-direction processing in human adults. Human infants are sensitive to dynamic gaze direction and to eye-like contrast polarity from birth. However, it is not known whether they rely specifically on contrast-polarity information to identify gaze direction. We tested six-months-old infants (N=48) and adults (N=32) using a spatial-cueing paradigm. On each trial, a target, randomly presented on one side of the screen, was preceded by a non-predictive central apparent-motion cue (a light and a dark square, swapping locations). We hypothesized that the sensitivity to the eye-like contrast polarity should result in perceiving the apparent-motion cue as directional despite its ambiguity. In infants we found faster initiations of saccades towards the target-location congruent with the movement direction of the dark – rather than the light – square, but only if the cue was accompanied by an auditory ostensive signal ("Look!" uttered with infant-directed prosody), rather than by a matched control sound. In adults saccades to the congruent target-location were faster in both the communicative and the non-communicative context. These results demonstrate that the sensitivity to the eye-like contrast polarity can support deriving directional information from dynamic stimuli, and are consistent with the existing findings about the role of communicative signals in gaze-direction processing by human infants.

# PAPER SESSION 1

## PS1-01
## The goggles experiment: Chimpanzees use self-experience to infer what a competitor can see

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We investigated whether chimpanzees can use self-experience to infer what another sees. In study 1, chimpanzees experienced either an opaque or a trick face mask that looked opaque from the outside but could be seen through when close to one's eyes. Then they participated in a gaze-following task with a masked human. Chimpanzees did not gaze follow more when they had experienced the see-through mask compared to the opaque mask. In study 2, chimpanzees first learnt that they could steal food from a human if unobserved. Then two boxes were introduced - one with an opaque lid, the other with a screen that looked opaque from the subject's perspective when closed, but transparent when open. In the test, subjects could choose to steal from one of the boxes (lids closed). Crucially, both lids now appeared opaque to the subject, but the experimenter could still see through the screen and removed the food immediately in this case. Chimpanzees preferred reaching for food under the opaque lid, and did not do so in a nonsocial control. We conclude that chimpanzees successfully used their self-experience to infer what the competitor sees. We will discuss our results in relation to the famous 'goggles experiment' and address alternative explanations.

## PS1-02
## Manipulating visual perspective to test core knowledge and simulation accounts of theory of mind

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How do children reason about mental states? Core knowledge accounts of theory of mind (ToM) propose that early and reliably developing mechanisms draw inferences from behavior to mental states by applying specialized data structures and algorithms (Leslie, Friedman, & German, 2004), whereas simulation accounts propose children use their own mental states as a basis for imagining what other people are thinking (Goldman, 2006). Each theory has motivated numerous studies but results are often consistent with both accounts. Testing children (4- to 6-year-olds) and adults,

we set up competing predictions by manipulating whether a participant had the same or opposite visual perspective as an agent with a true- or false-belief. Participants had to indicate where the agent would search for an object. If ToM depends on simulation, processing should be facilitated when a participant and an agent share the same visual perspective because the person's own primary representations match those of the agent and are readily available for simulating. But if ToM depends on inferences that operate over social cues, processing should be facilitated when the participant and agent have opposite perspectives – when the agent and participant face each other – because social cues emitted by the agent, especially gaze, are readily available. In both age groups there was an interaction: under true-belief conditions, participants were faster to respond when they and the agent had the same compared to the opposite perspective, but under false-belief conditions, they were faster to impute a belief when they and the agent had the opposite compared to the same perspective. The results suggest the developing mind is populated with both simulation and core knowledge mechanisms, but that simulation drives performance under true-belief conditions whereas inference drives performance under false-belief conditions. Implications of the results for functional specialization and developmental continuity will be discussed.

## PS1-03
## Children use source and quality of evidence to evaluate the beliefs of others

Hilary Richardson [1], Jorie Koster-Hale [2], Mika Asaba [3], Natalia Velez-Alicea [3], Rebecca Saxe [1]

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We predict and explain other people's actions by considering their mental states. Specifically when reasoning about someone else's beliefs, we consider both what they believe and why they believe it. In doing so, we evaluate the source and quality of the evidence other people have for their beliefs. Developmental evidence suggests that explicit reasoning about sources of knowledge develops relatively late (e.g. Taylor et al., 1994). More subtle inferences about the quality of evidence have not previously been investigated. We studied children's reasoning about beliefs based on four different kinds of evidence behaviorally and neurally, using fMRI. In "Seeing Good" stories, the protagonist had clear visual access to the evidence (e.g. a child infers that her Christmas present is a puppy based on seeing the puppy under the tree). In "Seeing

Bad" stories, the protagonist made an inference based on indistinct or unreliable visual evidence (e.g. seeing something that looks a dog's collar under the sofa). In "Hearing Good" stories, the protagonist had good direct evidence in the auditory modality (e.g.hearing the puppy barking). Finally, in "Hearsay" stories, the protagonist received the evidence through social report (e.g. being told by her older brother). In the behavioral experiment, children heard stories with just one source of evidence for the belief, and rated their own confidence in the protagonist's conclusion. Children expressed higher confidence in beliefs acquired via good visual evidence than through poor visual evidence, and tended to express higher confidence in beliefs based on hearsay than beliefs based on direct auditory evidence. Using multi-voxel pattern analyses we tested whether these different sources of evidence led to distinct patterns of activity in brain regions implicated in reasoning about other minds, and found that both quality and modality of evidence is represented in the RTPJ.

## PS1-04
## What makes 8- and 10-year-olds more egocentric in referential communication?

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The ability to consider others' perspectives is essential for communication. Yet the literature presents a puzzling developmental picture. On the one hand, studies showed that at the age of 5, children are sensitive to a communicative partner's limited perspective in referential communication tasks (Nadig & Sedivy, 2002; Nilsen & Graham, 2009). Nonetheless, other studies found that the amounts of egocentric errors individuals commit reduces continuously between 7 to 17 years of age (Dumontheil et al., 2010), and are frequently observed in adulthood (Apperly et al., 2010; Keysar et al., 2003). These findings highlight a major discrepancy in the perspective-taking literature. We identified two possible sources of these different levels of egocentrism within referential communication tasks (Keysar et al., 2003), corresponding to varied demands one faces in everyday social situations. These sources were examined in 8- and 10-year-olds to reveal any age related improvement in perspective-taking and/or its underlying cognitive abilities. Results suggest that first, both 8- and 10-year-olds responded slower to a communicative partner's instructions when there were more objects in their privileged view and fewer objects in the shared view. However, the size of the privileged ground and

common ground had no specific effect on children's egocentric tendencies in errors or response times. Second, both 8- and 10-year-olds committed more egocentric errors when their communicative partner delivered instructions with greater linguistic complexity. Interestingly, this effect did not interact with age, suggesting that 10-year-olds were no better than 8-year-olds at managing the additional demand incurred from complex instructions. Therefore, the complexity of the instructions likely explains some of the variation amongst previous studies. However, it does not account for the age related improvement in using others' perspectives during communication. The present finding not only has implications for interpretation of previous studies, it also highlights sources of difficulty in everyday communication.

# PAPER SESSION 2

## PS2-01
# The origins of analogy

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Analogical reasoning, the ability to compare relations across events, is crucial for higher-order cognition (Gentner & Medina, 1998). Recent theoretical accounts have argued that relational ability is the central cognitive difference between humans and other primates (Gentner, 2003; 2010; Penn, et al., 2008). A critical question is: how does this ability begin? We investigated the origins of analogical ability in 7- and 9-month-old infants, using the simplest and most basic relation – that of sameness and difference between two things (Ferry, Hespos, & Gentner, under review). Experiment 1 showed infants were unable to detect and generalize these relations from a single exemplar (as suggested in Tyrrell et al., 1991). Experiment 2 used four exemplars and found that infants could generalize the same-different relation to novel objects. More specifically, we asked whether infants' relational learning would show two signatures of analogical learning found in older groups: 1) alignment across exemplars facilitates relational learning; 2) individual object saliency disrupts relational learning. Infants were habituated to either a same or a different relation, and then tested with pairs alternating between novel and familiar relations. The results from Experiment 2 showed that infants detected the relational change, even for new objects, suggesting that infants abstracted the relations via comparing multiple exemplars. To test for the second signature, infants experienced a subset of objects individually before the habituation-dishabituation procedure. As predicted, infants failed to abstract the relations for these particular pairs, suggesting that object focus interfered with their ability to abstract relations. In a third ongoing experiment, we are testing whether labeling influences performance. Preliminary findings show that labeling the individual objects hindered performance, although labeling the relation does not have a strong facilitative effect at this early age. These findings are discussed in light of recent debates about phylogenetic continuity in relational abilities.

## PS2-02
## Causal learning, Bayesian inference, & the early development of abstract reasoning

Caren M. Walker, Alison Gopnik
University of California, Berkeley, USA

In several studies, we describe a surprising developmental pattern: Younger learners are better than older ones at inferring unlikely causal hypotheses from evidence. In these tasks, children had to infer that an effect was caused by a higher-order relation between two objects, rather than by features of each individual object. In the first experiment, 18-30-month-olds and 3-year-olds were introduced to a toy that played music when pairs of either "same" or "different" blocks were placed on top. Then, during test, children were given a choice between a novel pair of "same" or "different" objects to use to activate the toy. Toddlers performed above chance in both conditions, however, 3-year-olds were not, and performed significantly worse than younger children. We hypothesized that the older children had developed the general hypothesis that the causal powers of individual objects were responsible for the effects. Because this hypothesis had been well confirmed in their experience, it made it more difficult for them to consider the alternative relational hypothesis. In other words, knowing more may have made it more difficult to learn something new. To test this, we gave 3-year-olds information that disconfirmed the individual object hypothesis. The task was the the same, except that during each training trial, the experimenter first placed the objects on the machine individually, and the machine did not activate. Using this procedure led the 3-year-olds' performance to improve dramatically. Results suggest that the abstract constraints that guide relational inferences in causal learning are themselves learned. The theoretical explanations we propose for this pattern involve three related ideas from Bayesian machine learning: Development may proceed from a flatter to a more peaked prior, from high-temperature searches to low-temperature ones, and from exploration to exploitation. We consider each of these ideas, and their implications for current theories of learning.

## PS2-03
## Children prefer diverse samples for inductive reasoning in the social domain

Alexander Noyes, Stella Christie
Swarthmore College

Learners draw generalizations with inductive reasoning: a fact true of a diverse sample (e.g. zebra and mouse) extends further than a fact that only applies to a narrow sample (e.g. zebra and horse). Prior studies, however, have consistently shown that not until 9 years of age are children able to recognize the advantage of diverse samples (Lopez, et al., 1992; Gutheil & Gelman, 1997; Li, et al., 2009; Rhodes, Brickman, & Gelman, 2008; Rhodes, Gelman, & Brickman, 2008). Here we investigated why children failed to reason inductively by examining alternative learning contexts. Prior research has focused almost entirely on animal categories and generalizing biological properties. We hypothesized children would succeed in the social domain: generalizing toy preferences to people. Social categories like race and gender are highly salient and inform children's inferences and decision-making in other domains of reasoning (Kinzler, et al., 2010). Second, we revisited the animal domain in order to explore the role of sample contrasts. Previous research has relied on either taxonomic family or breed. For example, a zebra and a horse is a narrow sample because both share a family. These contrasts require children to distinguish samples on the basis of super- or sub-ordinate categories. Given children's difficulty with this kind of reasoning (Gelman & O'Reilly, 1988), these contrasts may underestimate children's appreciation of diverse evidence. Therefore, we tested children with samples that contrasted basic-level kinds (e.g., zebra/zebra versus zebra/mouse). In both studies children's task was to select the most informative evidence for discovering the extension of a property to a category. We measured how often children preferred the diverse evidence in different contexts: different properties (internal-biological versus preference) and different samples (people, family-level animal contrasts, and basic-level animal contrasts). These results give insightful windows into necessary learning contexts for children's inductive reasoning.

## PS2-04
## Strategic use of questions to solve a causal inference task in early childhood

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One way children learn about the world is by asking questions. The ability to ask informative questions develops during early childhood and afterwards. In the current study, we go beyond the question of whether young children can ask informative questions to investigate the extent to which they can do so, and in particular whether they can effectively use a hierarchically-structured set of hypotheses to narrow the space of options in a causal inference task. Participants (N = 60, 4-, 5-, 6-year-olds) were presented with 16 cards, each depicting an individual monster. Based on their body patterns, shapes and colors, the monsters could be categorized in a hierarchical structure with a superordinate level, a basic level, and a subordinate level. Children had to identify which monsters could activate a machine (and why) by asking yes-or-no questions. Results indicate a significant developmental decrease in the number of questions needed to complete the task. Across all questions, the proportion of single-object and subordinate-level questions decreased with development, accompanied by an increase in basic-level and superordinate-level questions. Thirty percent of the 4-year-olds, 52% of the 5-year-olds and 78% of 6-year-olds started the game asking either a superordinate-level or basic-level question. Few children asked single-object questions. We found a developmental increase in the percentage of correct explanations given. However, a higher percentage of 4- and 6-year-olds needed a second explanation prompt, compared to 5-year-olds. Among the correct explanations given, most 4- and 5-year-olds mentioned only the subordinate feature, as compared to 6-year-olds, who more often also mentioned the superordinate- or basic-level features. Our results provide evidence that children as young as 4 years old already have the capacity to identify and use hierarchical structure to ask effective questions to solve a novel causal inference problem, and can identify the feature responsible for the causal effect.

# PAPER SESSION 3

Invited Discussant:
Dan Sperber, Central European University, Hungary

## PS3-01
## Don't mention the marble! Children's focus of attention in standard false-belief tasks

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The present study follows up on our recent work on how pragmatic factors affect 3-year-olds' performance in standard false-belief tasks (Rubio-Fernández & Geurts (2013), How to pass the false-belief task before your 4th birthday; Psychological Science). Here we further investigated the role of the false-belief question in young children's poor performance in Theory of Mind tasks. In particular, we examined three discourse-pragmatic factors: (a) the form of the wh-question, (b) children's focus of attention in the test phase, and (c) the form of their response. The results of three experiments confirmed that 3 year-old children are able to explicitly choose the correct answer in a false-belief task provided that they are allowed to focus on the protagonist throughout the task. However, making children focus their attention on the target object in the test phase had a negative effect on their performance. We conclude that the questions that have been used in standard false-belief tasks may have effectively hindered young children's performance.

## PS3-02
## Quantifier spreading: children misled by ostensive cues

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We discuss a methodological problem of language acquisition studies: in experiments testing children's sentence interpretation, the stimuli are often misinterpreted as ostensive cues, as a consequence of which they elicit reactions that do not occur in natural circumstances. The cause of misinterpretation can be the iconicity of the stimuli. We illustrate this with an experiment involving quantifier spreading. If children are shown a drawing containing three girls riding a bicycle and an additional bicycle, and are asked Is every girl riding a bicycle?, they often answer No, not that one – pointing at the empty bicycle. When we eliminated the iconicity of the stimuli, by replacing the drawings with real life photos containing many accidental details, the occurrence of quantifier spreading dropped radically. The misinterpretation of stimuli as ostensive signals can also be due

to the situation in which they are presented. We illustrate this with an experiment testing whether preschoolers can access the 'at least n' reading of numerals in sentences like The bears who collect three berries get a candy, i.e., whether they think that a bear collecting four berries is also entitled to a candy. We repeated the experiment in contexts of different naturalness. In clearly test-like circumstances, the interpretation of three as an ostensive clue blocked the option of 'more than three' for all children. The more we hid the test-like nature of the task, the more easily children accessed the 'at least three' interpretation.

## PS3-03
## Young children's automatic and alternating use of scene and object information in spatial symbols

Moira R. Dillon, Elizabeth S. Spelke
Harvard University, Cambridge, MA, USA

Although symbolic understanding has long been studied, little is known about the 2D shape information children use to relate symbols to their 3D referents. Our previous research suggests that young children rely on length and angle to find locations on objects, but on distance and direction to find locations in scenes. These studies, however, either presented drawings from non-canonical perspectives or probed children's use of symbols in unusual environments. Moreover, these studies explored the factors that limit children's understanding of spatial symbols, not the sources of their flexibility in this domain. For the present study, we showed 144 4-year-old children three types of drawings of a typical room, depicting the room's objects, its extended surfaces, or both. In one task, children used the drawings to find targets located either at the junction of two extended surfaces in a room or next to objects in the room. In another task, children judged whether drawings that include just scene or just object information are better depictions of targets at these two types of locations. We found that the limitations previously observed in children's use of spatial symbols extend to highly realistic perspectival drawings: children perform better with scene drawings when targets are located at the junctions of extended surfaces in the room and better with object targets when targets are located near objects, but gain no additional benefit when presented with both types of information. In addition, children show no awareness of this pattern in their performance: they judge drawings of objects to be more informative of all target locations. Common drawings evidently present geometric information in a format automatically accessible to cognitive systems for navigation and object recognition. Young children nevertheless fail to integrate the information that these systems represent, even when shown drawings of the most familiar and natural kinds.

# POSTER SESSION A

## PA-001
## Is it the thought that counts? How children allocate rewards based on intentional effort and outcome.

Ashley Thomas, Barbara Sarnecka
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Recent research suggests that children as young as four years of age allocate rewards based on merit (Baumard, Mascaro, & Chevallier, 2012; Shaw & Olson, 2012). For example, if Tim and John both clean their rooms, but John works harder, children believe that John deserves more reward. However, these studies do not differentiate whether children reward the harder worker because of a better outcome (i.e. a cleaner room) or for the effort in itself. The current study explores how children allocate reward, differentiating between intentional effort and outcome. Children, aged 4-10, were told six vignettes in which two boys are instructed to clean their rooms. After hearing the story, participants were asked to allocate rewards to the boys in the stories. The conditions differentiated whether the outcome was equal (either both rooms messy or both rooms clean) or unequal (one room equal,one room clean) and intentional effort, i.e. whether intention and effort exerted was equal or unequal. ANCOVA was used to analyze the preliminary data. Preliminary results show an overall shift from equality based resource allocation to merit based allocation with age, echoing previous findings. Results also suggest that intent seemed to have played a larger role in reward allocation than effort in itself. Younger children (ages 4.5-6) tended to allocate rewards based on outcome, and older children (ages 7-10) took both intent and outcome into account.

## PA-002
## On the spontaneous ability of humans to use and make great ape tools

Eva Reindl, Sarah R. Beck, Ian A. Apperly, Claudio Tennie
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Among other cognitive features, the ability to use and make tools is shared by humans and several other species, such as great apes and crows. Still, the range and complexity of human-made tools are unique in the animal kingdom and researchers have investigated why human tool use is special. The zone of latent solutions (ZLS) theory states that while humans have been able to use imitation and teaching to accumulate innovations over time, non-human animals acquire tool use behaviors mostly by individual (re-)inventions (latent solutions) and are thus restricted by their

species' ZLS. It is assumed that humans are also able to invent some tool use behaviors on their own and without cultural resources, but knowledge about the kinds of tool use behaviors lying within the human ZLS is sparse. We explored the content of the human ZLS by presenting children between 2.5 and 3.5 years of age – humans who have been little influenced yet by their cultural surroundings – with 12 problem-solving tasks based on tool use behaviors observed in wild chimpanzees and orangutans. Spontaneous tool use was observed in 11 tasks, suggesting that these behaviors lie within the human ZLS. Additionally, children were more successful on tasks based on great ape behaviors which occur frequently in the wild compared to those based on low-frequency behaviors. The physical cognition abilities underlying these tool use behaviors are likely to be shared not only by humans, chimpanzees, and orangutans, but also by their last common ancestor living 15 to 19 million years ago.

## PA-003
## Early reasoning about affiliation and caregiving

Annie C. Spokes, Elizabeth S. Spelke
Harvard University, Cambridge, USA

Researchers have made great progress in understanding early human social cognition. Nevertheless, two questions remain unanswered: Do infants organize observed social relations into larger structures, inferring the relationship between two social beings based on their relations to a third party? Second, how do infants reason about a type of social relations prominent in all societies: caregiving relations? In several experiments using animated displays and abstract social characters, we approach both questions by asking whether 15- to 18-month-old infants expect two babies comforted by the same caregiver to affiliate with one another. In our first experiment, infants were introduced to three small "babies" and two large "caregivers." During familiarization, one caregiver comforted two babies, and another caregiver comforted the third baby: comforting events infants perceive as meaningfully related to their own experiences (Johnson et al., 2007). At test, pairs of babies affiliated in alternating events. Infants looked significantly longer to affiliation between babies with different caregivers, suggesting these relationships were more novel or surprising. Infants incorporated past comforting interactions when predicting future affiliation among babies. We replicated these findings and extended them to interactions among equal-sized characters with the same results. Finally, we asked whether infants developed this expectation in a different social context: playful peer interactions. Infants no longer expected

individuals with a shared third-party relation to affiliate with one another. Although test events were identical, infants' interpretation of them differed, based on prior familiarization. Our results show that infants infer relationships between two characters based on their relations to a third party in a caregiving context, not in a positive social context among peers. Infants appear to be sensitive to at least one aspect of kinship relations and organize these relations into larger structures.

## PA-004
## Is Fireman Sam real? The development of judgments about ontological status and authenticity

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This study reexamined children's judgments of the real/not-real status of fictional characters given that such judgments can be based either on the ontological status of the character or on the authenticity of the character. Sixty children (4;1-years and 5;3-years) and 20 adults were shown paired photographs of fictional characters (e.g., Bob the Builder) and people dressing-up as those characters (e.g., a person wearing a Bob the Builder costume). They were asked whether each depicted figure lives in "the real world" (ontology question) and whether each figure is "the real" fictional character (authenticity question), and why. As expected, younger children, and to some extent older children, made more accurate authenticity judgments than ontology judgments about the characters whereas adults made accurate judgments in reply to both questions. A similar pattern emerged for the number of justifications that were produced. Implications for the development of children's ability to make real/not-real judgments about fictional characters are discussed.

## PA-005
## The development of intention-based moral appraisal

Francesco Margoni, Luca Surian

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During preschool years children's moral evaluation start to be based more on mental state information rather than action outcome. For the first time we studied the outcome-to-intent developmental change in judgment of moral goodness and rewardability. We studied 4- and 5-year-old children, since this is the period during

which the outcome-to-intent shift for moral condemnation has been documented in previous literature. Children were asked to evaluate both the goodness and the rewardability of attempted and accidental helping events. We found evidence of an outcome-to-intent shift. The approval of attempted help increased with age, reaching at five years an adult level. Overall, we detected an accentuation with age of an already existing but weaker pattern of moral evaluation. Children judged attempted help more good than rewardable, and in the accidental help trials judgments of deserved reward constrained judgments of goodness, but not vice versa. We suggest that our findings are more consistent with the hypothesis that the outcome-to-intent shift reflects changes outside the moral domain rather than a conceptual reorganization within the moral domain.

## PA-006
## Privileged access and perspective taking

Szabolcs Kiss [1], Zoltán Jakab [2]

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This poster reports two experiments targeting the development of understanding privileged access with subjects between 5 and 9 years of age. Privileged access to mental states is the idea that we have better, or more direct, access to at least some of our mental states than do others. At a minimum, this implies that we access some of our mental states in a way unmediated by our own (or anyone else's) behaviour, whereas other people's mental states we can only access via their behaviour. We addressed the following two research questions: (1) At what age do children attribute privileged access to themselves and others? (2) Is there a difference between attribution of privileged access to the self versus those to others? In the experiments we presented a puppet play to the children into which we inserted our so-called contrastive questions regarding the understanding of privileged access. In the first experiment we found a developmental trend and a question-type-specific effect in attributing privileged access to self and other. Reversing the order of first-person and third-person-related questions in the second experiment eliminated all the effects found in the first one. We suggest that our findings indicate that children's understanding of privileged access proceeds from their first-person perspective to a generalisation to other people.

## PA-007
# Inferential pragmatics and epistemic vigilance: A developmental perspective

Diana Mazzarella
University College London, London, UK

Sperber (1994) suggests that development of pragmatic abilities corresponds to changes in the interpretive strategies deployed, from what he calls 'naïve optimism', to 'cautious optimism' and finally 'sophisticated understanding'. While naively optimistic interpreters assume the competence and benevolence of communicators, more sophisticated interpreters allow for the possibility that speakers may not be competent with regard to what is relevant to them or may not be honest.

The aim of this paper is two-fold: (i) to assess the empirical validity of this developmental trajectory, (ii) to explore the cognitive underpinnings of sophisticated interpretative strategies.

(i) I question the existence of a stage of naïve optimism. Southgate, Chevallier & Csibra (2010) show that even 17-month olds are able to track the communicator's epistemic state and use this to infer what she intends to refer to, so the 'cautiously optimistic' interpretative strategy seems to be already in operation.

(ii) I argue that cautious optimism and sophisticated understanding can be conceived of as epiphenomena of the interaction between the pragmatics system and epistemic vigilance mechanisms, which assess the quality of the incoming information and the reliability of the individuals who dispense it (Sperber et al., 2010). Epistemic vigilance may play a crucial role in the process of identifying the speaker's meaning (comprehension) as well as in the process of deciding whether to believe it (acceptance).

This opens up an interesting direction of research in pragmatics: the development of pragmatic abilities may rely on improvements in epistemic vigilance capacities.

## PA-008
## Achieving abstraction through explanation

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Generating explanations has a powerful impact on learning, even when explanation is self-directed and no feedback is provided. How might explaining foster insights in the absence of new data? We propose that explaining imposes top-down constraints on the learner, leading children to privilege hypotheses that highlight abstract structure. There are a variety of reasoning skills that are dependent upon children's ability to recognize abstract regularities in the face of conflicting perceptual cues, including the development of relational reasoning. We therefore explore the extent to which explanation facilitates the recognition of abstract properties in a relational match-to-sample task.

Children observed 12 triads, consisting of a target, an object match, and a relational match. All 12 targets depicted the relation same (e.g., two squares). Within a triad, the object match included one shape identical to the target (e.g., a square) alongside a different shape (e.g., a triangle), and the relational match was composed of two novel shapes in the same relation (e.g., two circles). Five-year-olds observed as the experimenter placed the target and relational match together for two triads. Depending upon their condition, the child was asked to explain or report these matches. For the next two triads, the child selected the match herself, and was again prompted to explain or report her selection. This continued for 12 triads, with the experimenter and child alternating every two turns. Children provided a total of 12 explanations (or reports) and generated 6 matches.

Explainers were more likely to select the relational match than controls, and the number of relational matches remained constant across trials, indicating no effect of learning over multiple trials. Findings support the hypothesis that explanation influences how children exercise their representational abilities, scaffolding the transition from a preoccupation with salient surface features to considering abstract properties.

## PA-009

# Maternal cortisol awakening response during pregnancy is associated with offspring stress-induced cortisol response at four months of age

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The Developmental Origins of Behavior, Health and Disease (DOBHaD)-hypothesis encompasses the short- and long-term consequences of the conditions of the developmental environment for behavior, health and disease risk. Prenatal exposure to maternal anxiety has been associated with offspring cognitive ability. Altered hypothalamo-pituitary-adrenocortical (HPA)-axis function is supposed to be an underlying mechanism. Therefore we examine whether maternal saliva cortisol and emotional state during pregnancy are associated with stress-induced cortisol response in the four month old offspring.

A cohort of 139 pregnant women between 19 and 45 years of age participated in the study. Maternal emotional state was measured in each trimester (i.e, 5-14, 15-27 and 28-40 weeks) of pregnancy with the State Trait Anxiety Inventory, the Pregnancy Related Anxiety Questionnaire and the Edinburgh Depression Scale. Saliva cortisol samples were taken at awakening, 30 minutes after awakening, at noon and in the evening. In a subgroup (n=66) infant stress-induced cortisol response was measured with 5 saliva cortisol samples; one before inoculation (basal cortisol) and at 15, 30, 45 and 60 minutes after inoculation. Data were analyzed with repeated measurements regression analysis. A small significant association was found between maternal cortisol awakening response in 2nd pregnancy trimester and infant cortisol 15' after vaccination)(Spearman rho=-.293; p=0.022). This result gives some evidence for prenatal programming of infant HPA-axis by maternal anxiety. However, there was a lack of significant associations between maternal emotional state measures and infant cortisol measures. Therefore, the role of moderators such as mother-infant interaction should be further explored.

## PA-010
## Small on the left, large on the right: Evidence for a Posner-SNARC effect in preverbal infants

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Adults map numbers onto a left-to-right oriented spatial axis, along which they are represented as ordered magnitudes, consistent with the existence of a mental number line (Dehaene, 1992). For instance, it has been shown that looking at numerical digits causes spatial shifts of attention to the left or right sides depending upon the numbers' magnitude (i.e., Posner-like effect, Fischer et al., 2003). While it is commonly proposed that culture has a prominent role in shaping the direction of this number-space mapping (Shaki et al., 2009), recent studies on non-human animals (Adachi, 2014) and preverbal human infants (de Hevia et al., 2014) have raised the possibility that a directional number-space mapping might precede the influence of any formal education. In a series of studies with adults and 8-month-old infants we investigated whether perceiving numerical and non-numerical magnitudes caused lateralized shifts of visual attention. Using an eye-tracking system in a free looking condition, we measured the time to detect a target presented either on the left or the right side of a screen after the onset of a small-magnitude or a large-magnitude numerical (arrays of dots) or non-numerical (shapes that varied in physical size) cue. Results showed that in adults both numerical and size cues induced attentional shifts to a peripheral region of space that is congruent with the magnitude relative position on a left-to-right oriented mental number line. The same Posner-like effect was obtained also in infants, but only for the numerical cues. These findings suggest that a directional number-space mapping takes place in early stages of development, before the acquisition of symbolic knowledge, and that such mapping is specific to number in infancy and generalizes to non-numerical continuous dimensions at later ages. The results provide suggestive evidence that the mental number line is not merely a product of human invention.

## PA-011
# Majority-biased transmission does not extend to irrelevant action copying in children

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Objective: Irrelevant action copying (dubbed "overimitation") is a well-documented phenomenon in dyadic experimental settings, thought to increase with age. However, theoretical investigations of social learning strategies imply that social learning in the real world should be selective in its use of social information. The tendency to copy the behaviour of the majority is regarded as a key strategy that might play a central role in the acquisition of effective and reliable behaviour. Here we test whether previous evidence for majority-biased transmission in children extends to the adoption of irrelevant actions.

Methods: Children aged four to six years old (N=260) were assigned to one of five conditions. In four conditions, participants watched a video of four demonstrators obtaining a reward from a puzzle box before receiving a chance to obtain the reward themselves. In three of these videos, the number of demonstrators performing an irrelevant action varied between one (minority), three (majority) and four (all). The fourth video condition, involving no irrelevant actions, determined whether participants demonstrated majority-biased copying when choosing between two causally equivalent actions. The remaining condition was an asocial learning control.

Results and conclusion: Participants demonstrated majority-biased copying when faced with a choice between two causally equivalent actions. Participants also demonstrated majority-biased copying when the majority omitted the irrelevant action but the minority person did not. In accord with previous studies, there was a strong tendency to copy the irrelevant action when all demonstrations included it. However, the majority bias that children exhibited in previous conditions disappeared when children were faced with a majority who performed the irrelevant action and a minority who demonstrated that it was superfluous to obtaining the reward. This tendency to disregard the irrelevant action increased with age. These findings throw into question the robustness of irrelevant action copying as a phenomenon in real-world settings.

## PA-012
## The effect of eye contact on the retention of information (an adult study)

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Learning information that can be generalized to kinds has been shown to rely highly on the presence of ostensive-referential cues used by teachers to direct novices´ attention to the relevant aspects of their message (Csibra & Gergely, 2009). Also, the type of information infants attend to depends on the presence or absence of ostensive-communicative signals (Chen et al., 2011; Yoon et al., 2008).

Here, we present a series of six experiments aimed at identifying the kind of information for which ostensive signals are particularly relevant in adult participants (N: 188, aged 18 to 35 years). We isolated a simple ostensive cue, eye contact, and evaluated how adults are influenced by its presence when they are scantly exposed to information of different kinds (presented by an actress), ranging from digit span, word and nonword span to more complex knowledge such as names or generic/specific facts about novel objects.

We found no effect of eye contact on the lower level tasks (digit span, word and nonword span). By contrast, eye contact had an impact on the retention of specific facts. One week after one single exposure to a movie in which the actress made or did not make eye contact with the participants, specific facts were better remembered when presented ostensively. We suggest that in adults, ostensive cues may consolidate the memory traces of episodic facts even after a brief encounter with a novel fact. Because of its selectivity to particular kinds of information, this effect cannot be explained by a simple increase in attention. Instead, it appears that ostensive cues modify the relevance of otherwise meaningless episodic information.

## PA-013
## Those fair girls? Sex differences in sharing goods and correlations with inhibitory control

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No other species seems to cooperate the way humans do (Tomasello & Carpenter, 2007). The tendency to behave fairly might constitute one important component of cooperation. Even infants prefer equal distributions of goods (Schmidt & Sommerville, 2011). Preschoolers give more to others than would be expected in a purely economic sense (30-40%, Lucas, Wagner, & Chow, 2008). However, they do not share half their goods. Fairness may only be one aspect of sharing behavior. Cognitive factors like inhibition might also play a role: Sharing requires inhibiting the impulse to own it all. Our study investigates whether inhibition correlates with fairness in preschoolers. An adaptation of the Dictator Game (Gummerum et al., 2010) and an inhibition task (Carlson, Davis, & Leech, 2005) are used with 3.5-year-olds. Since a previous study revealed a sex difference concerning correlations between fairness and theory of mind (Hoehl, Munske, & Schoenmaekers, 2013), data are analyzed separately for both sexes. Preliminary results (N=17, 8 male, 9 female) show a sex difference for the number of goods offered to an unknown child: Girls tend to give more to the other child ($U=18.5$, $Z=-1.71$, $p<.10$). Furthermore, boys are less fair than girls: they deviate more from giving half of their goods ($U=15.5$, $Z=2.04$, $p<.05$). Only in girls a marginally significant correlation is found between fairness and inhibition ($\tau=.54$, $p<.10$). Further data collection is under way.Results will be discussed regarding the development of fairness and possible explanations for sex differences.

## PA-014
## Conceptual information is remembered better than perceptual information in infant working memory

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Our mental representations of objects we view in the world are rich with both perceptual information (e.g. color, shape) and conceptual information (e.g. agentiveness, purpose). But when those object representations must be stored in limited working memory, is some information privileged over other information? To address this question, we tested

6-month-old infants' working memory for two object properties: topology (a perceptual property) and humanness (a conceptual property), both of which are highly behaviorally relevant to infants. In experiment 1, we hid two topologically distinct objects separately behind their own screens. We then lifted one of the screens and showed infants that the object had either changed or remained the same. We found that infants remembered the topology of only one of the two objects, and forgot the topology of the other, consistent with previous results on infants' working memory for metrical shape (Kibbe & Leslie, 2011). In experiment 2, we used the same method but hid two agentively distinct objects, a ball and a doll's head. This time infants succeeded, recalling "humanness" where they failed to recall topology. Finally, in experiment 3, we confirmed that infants' success in experiment 2 was not due to perceptual differences in the objects by inverting the doll's head to disrupt face processing. Infants once again failed, demonstrating a robust failure to remember perceptual properties. Together, these results suggest that conceptual information is privileged over perceptual information in infant working memory. We discuss implications for the structuring of object representations throughout the lifespan.

## PA-015
## Word mapping in the emerging domain of moral knowledge

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The aim of the study is to investigate whether infants' emerging moral competence is also mapped early onto appropriate lexical items. Twenty-month-olds' knowledge of the word "good" was tested in two core domains of moral reasoning: fairness and harm. For the domain of fairness, infants were exposed to live events in which a fair teddy-bear mother gave a cookie to each of her cubs, while an unfair bear mother gave both cookies to one cub and nothing to the other. In Experiment 1, twenty-three infants were asked to pick up "the good bear-mother", and they selected preferentially the unfair mother (p=.03). In Experiment 2, twenty infants were asked to pick up "one of the bear-mothers", and they selected preferentially the fair mother (p=.052). For the domain of harm, 26 infants were presented with helping and hindering agents, followed by a choice test between the two agents. Infants were asked to pick up "the good one" (Experiment 3). No significant differences were found.

As a control study, infants' knowledge of the word "good" was investigated also in the domain of food. Twenty-three infants were presented with a choice test with three pairs of food cards. The experimenter asked to pick up "the good one" (Experiment

4). Most infants selected the items typically liked by young children ($p < .01$). Overall, these results suggest that at 20 months, the term good is correctly mapped to relevant qualities in the food domain, but not yet in domains of harm and fairness.

## PA-016
## Are you watching me? How an audience impacts on imitation behaviour

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Recent work suggests that direct eye contact is a powerful social cue which influences learning, evaluation and imitation. However, it is not known how or why children respond differently to events when direct gaze is present. Here we test if gaze changes imitation behaviour in children by means of an audience effect, where the child takes into account whether an adult is watching during the respond period.88 primary school age children took part in this study. On each trial, the child saw an experimenter perform a sequence of actions to open a box, including an unnecessary action. The experimenter then observed the child, turned away or left the room before the child had a chance to open the box. The number of times the child performed the unnecessary action was scored from video. Results showed that children copied the unnecessary action more when the adult was watching or when she left the room, but copied less when she turned away. This parallels infant studies which suggest that turning away from an event is a social cue to disengagement. The present data suggests that audience effects are important in determining which actions a child chooses to imitate. We evaluate this finding in relation to brain imaging and behavioural studies of direct gaze and audience effects in a variety of contexts.

## PA-017
## Theory of mind and inhibitory control in individual differences in 4-5 year-olds' co-representation of a joint task

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Previous research has shown that children aged 4-5 show similar co-representation effects as adults in a joint task involving complementary actions (Milward, Kita & Apperly, 2014), but not in a younger age group (2-3 years). This has led to questions surrounding which cognitive pre-requisites may be necessary for co-representation to occur. Adult studies have highlighted the role of Theory of Mind (Humphreys & Bedford, 2011) and intentionality understanding (Tsai, Juo, Hung & Tzeng, 2008; Atmaca, Sebanz, Prinz & Knoblich, 2011) in co-representation. The current study tested 4-5 year-olds on measures of Theory of Mind, Inhibitory Control and Working Memory alongside a within-subjects version of the co-representation measure from Milward et al. (2014). Results showed replication of the original co-representation effect ($t(107)=-2.56$, $p=.01$) at this age. Additionally, regression analyses found that worse performance on Inhibitory Control ($\beta=.12$, $t=2.34$, $p=.02$) and Theory of Mind ($\beta=.20$, $t=2.06$, $p=.04$) measures independently predicted greater co-representation effects, but Working Memory did not play a role. Inhibitory control is thus likely to help children to avoid the interfering effects of co-representing a partner. Likewise, the ability to separate in mind two competing beliefs is argued to be related to the ability to separate self and other representations in a joint task, where such representations are conflicting. These results provide an insight into the processes involved in early joint action understanding.

## PA-018
## Emotion understanding in deaf children

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The understanding of other people's emotions is one of the most salient aspects that makes communication and relationships work. Because emotions are usually conveyed by both visual and auditory information, it was suggested that deaf individuals may be impaired in emotion understanding precisely because they lack the access to the auditory component. In particular, very little is known about emotion understanding in deaf children, how it develops over years, and whether some emotions are discriminated better than others in comparison to hearing children.
To address these issues, we tested 3 congenitally deaf children, age-matched with three different groups of hearing controls on a task consisting in a series of videos showing faces gradually changing emotions through a morphing technique (e.g., from happy to sad, from surprised to fearful, etc). Children were asked to press a computer button as soon as they detected the target emotion (i.e., sad, happy, fearful, surprised).

We found that deaf children did not differ in terms of accuracy compared to hearing controls but were overall faster in providing the response. The faster reaction times of the deaf children were particularly evident in the presence of fearful faces. However, while this was true for the 4- and 5- year old, the 6 years old did not prove faster than the control group.

Our preliminary results suggest that congenital auditory deprivation causes higher reactivity to negative emotions during early development likely as a form of compensation to emotions that are evolutionary more salient than positive ones.

## PA-019
## Children's cooperative and competitive argumentation with peers

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Recent accounts suggest that reasoning is a social skill, which enables humans to evaluate and produce arguments in interpersonal exchanges (Mercier & Sperber, 2011; Tomasello, 2014). We investigated how children's argumentation with peers changes in cooperative and competitive contexts. 48 pairs of 5- and 7-year-olds were asked to build a zoo together and were presented with four cages (two assigned to one child, two to the other). Children jointly decided to place 14 toy animals in one of the four cages. In the competitive context, whoever had more animals in his/her cages would win the game. In the cooperative context, they would both win the game, if they place the animals nicely. Children's arguments/reasons for the placement of items were extracted and coded for: 1) whose cage the item should go: one's own cage vs. the peer's cage; 2) the kind of argument: affirmation (why an item should go to a cage) vs. refutation (why an item should NOT go to a cage). Both age groups engaged in more frequent and more objective reason-giving in the cooperative context than in the competitive context. In the competitive context 7-year-olds used more sophisticated strategies than 5-year-olds: while 5-year-olds favored their own cages with affirmative arguments (explained why the item should go to their cages), 7-year-olds also used refutations (explained why the item should not go their peers' cages). Our results suggest that cooperative settings, in which joint decisions benefit both parties, provide a facilitative context for reason-giving in children's argumentation with peers.

## PA-020
## Children's predictions about future desires: Parent input vs. intuition

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Children readily learn from informants about external phenomena (Bascandziev & Harris, 2010); however, little is known about how children are influenced by others about internal phenomena like desires. Recent research shows that children often fail to ignore current desires when forecasting future desires (Atance & Meltzoff, 2006). The current study joins the lines of research on children's use of informants and children's desire forecasting; we investigate how children respond when informants provide input about future desires. While eating pretzels to induce thirst, children aged 3-12 (n=167) were asked to agree or disagree with parents' labels of external entities (hybrid images). Children also took part in a 'cold cognition' task assessing reasoning about future desires. The thirsty children then predicted whether they would want pretzels or water the next day; this was preceded by experimentally-manipulated input from parents about what the children would want. In a baseline condition, 81% of children preferred pretzels over water; after thirst induction, 41% of children predicted that they would want pretzels the next day, $p<.001$. There was no influence of experimentally-manipulated parent input about future desires; however, willingness to agree with parents about external phenomena (hybrid image labels) positively predicted willingness to agree with parents' input about internal phenomena (wanting pretzels or water the next day). Performance on the cold cognition future planning task also positively predicted acceptance of parental guidance on future desires. We discuss implications of these novel findings for children's reasoning about mental states in a social context.

## PA-021
## Dance like nobody's watching: Infants display a wider variety of rhythmic movements to music in the absence of a social partner

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Moving rhythmically in time to music is a universal human behaviour (Ayres, 1973). Whilst the developmental literature suggests that infants under two years of age do not yet possess this skill (Zentner & Eerola, 2009), a quick search of YouTube reveals

thousands of home videos of dancing babies. Are there conditions in which infants can synchronise to the beat of a song? The current study aims to disentangle the effects of social interaction and motoric skill in the facilitation of synchronisation. Eighteen month old infants were presented with four songs of varying tempos, and engaged in a bell-ringing task, either in the presence of a live human experimenter or an animated non-social partner. Results show that infant bell-ringing to music is not synchronous to music at an adult level, and that level of synchrony is not affected by the presence of a social partner. However, infants are closest to synchrony when the tempo of the song is closest to their spontaneous motor tempo. Further, infants show more varied non-ringing rhythmic behaviours, and for a longer duration, in the absence of a live partner. Taken together, these results suggest that movement to music is still developing at eighteen months of age, that a social context does not facilitate accuracy, perhaps even inhibiting spontaneous responses to music, and that motor control may play an important role in the quest for synchronisation.

## PA-022
## Discovering new object kinds in dynamic environments: eye-tracking evidence from a match-to-sample task

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Word and category knowledge constantly interact. Infants can exploit labels as a cue to recognizing categorical relationships between visual objects. Similarly, they can use category knowledge to acquire new words. There is little evidence however regarding infants' ability to learn new object categories while engaged in other cognitive tasks whose completion could be also facilitated in the presence of labels. Here, we investigated the influence of labeling on discovering sorting rules applied to novel object kinds. Two groups of twelve-month-old infants (n = 14) participated in a gaze-contingent match-to-sample task. After the presentation of a sample stimulus, they could choose between two alternatives in a test array (same vs. vs. different category), the former of which would trigger a reward animation when fixated. Infants were exposed to pictures from two natural object kinds (frogs, parrots), with different exemplars presented on every trial. Thus, in order to succeed in the task, infants had to represent abstract object kinds rather than individual items. In one group the sample item presentation was accompanied by a verbal label (This is a peko!), in another by a referential phrase without a label (Look! Wow!). Only infants presented with the object

names directed their gaze significantly more often to the same-category targets, and spent significantly more time fixating on the same-category targets than on the different-category distractors. The present results suggest not only that infants may exploit labels for rule learning, but also that they could do so while simultaneously engaging in category learning process.

## PA-023
## Does proprioception affect contingency detection in early infants? : A study using a digital pacifier

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This study investigated how infants perceive and integrate multimodal information. Many studies show that infants can detect the relationship between their own action and succeeding external stimuli. For example, 5-month-old infants preferred non-contingent leg motion to contingent one. This suggests that infants prefer miss-match in proprioception and vision. Besides, lots of researchers reported that infants attend to synchronizing audio-visual stimuli suggesting that infants' sensitivity to temporal matching. The preceding studies pose a question-how do infants show such different preferences? Here, we conducted an experiment to tackle with the question by systematically controlling synchronization of proprioception and audiovisual stimuli. To produce visual-proprioceptive contingent stimuli, we used a digital pacifier as a device to sense infant's dynamic sucking behaviors. 5-month-old infants viewed two dynamically moving circles on a monitor in two different conditions. In AudioVisual condition, one circle's movement was synchronized with pitch of a sound, the other moved independently. In ProprioceptiveAudioVisual condition, one circle's movement and pitch of a sound changed based on the infant's sucking, the other moved independently. The result of experiment showed that in the AV condition, infants exhibited no clear discrimination of the two circles. However, in the PAV condition, they paid more attention to the non-contingent circle than contingent one. The result showed that exploration of audiovisual feedback to their sucking changes infants' preference for the multimodal integration, suggesting the specialty of the self-generated motor commands and/or proprioceptive feedback.

## PA-024
# Children's knowledge acquisition: Comprehension of the epistemic function of the marker –DIr in Turkish

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Children's ability to understand sources of knowledge is crucial for their critical thinking and learning. A surge of recent interest on this issue has mostly focused on how young children evaluate the relative certainty of speakers, or the relative evidential strength of statements (seeing vs. being told). An understudied area is how children's ability to make use of the grammaticalized information on "epistemicity" develops.

The present study investigates children's understanding of the epistemic function of the suffix –DIr in Turkish. –DIr is attached to verbal as well as non-verbal predicates. Depending on the discourse context, it can denote one of two functions; as a factive modality marker – it conveys categorical/generic information; as a non-factive modality marker, it indicates that the statement is asserted with less than full certainty. Experimental data on the comprehension of -DIr is limited (Aksu-Koç & Alıcı, 2000; Tamm et al.,2014). Here, we report evidence on the comprehension of the epistemic function of -DIr by monolingual Turkish 4- to 6-year-olds.

Borrowing from the selective learning paradigms (e.g., Koenig & Harris, 2005), we used a procedure that consists of presenting children with contrastive sentence pairs about the whereabouts of a particular toy animal (e.g., a hidden object task) (e.g., Kuzu mavi kutudaDIR. [The lamb must be in the blue box.] vs. Kuzu sarı kutuda. [The lamb is in the yellow box.]). The findings reveal that when compared with 4-year olds (M=3.90; SD=0.27), 5-year-olds (M=5.38; SD= 0.37) and 6-year-olds (M=4.96; SD=0.27) reliably differentiate the degree of speaker certainty with regards to utterances marked with –DIr ($p<.002$ and $p<.01$, respectively). The methodological and theoretical implications of these results for the interface between conceptual and linguistic development will be discussed.

## PA-025
## Children's understanding of Hungarian pre-verbal focus sentences

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According to the pragmatic tolerance hypothesis proposed by Katsos and Bishop (2011) children at the age of 5 to 7 produce the same response pattern as adults in a scalar implicature derivation task if the task enables participants to give “true”, “false”, and “neither true nor false” responses. Taking this observation into consideration we investigated in a ternary judgment task how Hungarian children at age of 4 to 7 evaluate Hungarian pre-verbal focus sentences against exhaustive, non-exhaustive and contrafactual pictorial context. 24 adults and 43 children participated in the experiment. We found as it had been expected that 7-year-olds answer in a more adult-like way; however, there were considerable individual differences within the entire child group. A reasonable hypothesis is that these differences may be explained by taking some non-linguistic factors such as cognitive flexibility, theory of mind or working memory into account (e.g.: Foppolo et al., 2011; Kas and Lukács, 2013). Starting from this hypothesis we carried out a new experiment in which 27 children at the age of 3 to 4 participated. Besides the sentence-picture verification task two executive function tasks were introduced. We found that children’s response pattern at this young age was much more inconsistent when pre-verbal focus sentences were presented in non-exhaustive than in exhaustive or false contexts. Furthermore, children who passed the executive function tasks responded to focus sentences in contrafactual or exhaustive context in a more consistent pattern than children who did not pass them.

## PA-026
## Understanding of the register of IDS and ADS: Evidence from Japanese-learning toddlers.

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Recent studies revealed that 3-year-olds can understand that people change their way of speaking (i.e., register) depending on the addressee. Considering infants form social categories (e.g., gender, age) and speech categories (e.g., IDS, dialect) early in

development, it is possible that younger children understand the relationship between them. Then, this study examined whether toddlers understand the relationship between the register and the addressee focused on IDS and ADS.

Japanese-learning 20-28 month-olds were tested using habituation switch paradigm. In the habituation phase, toddlers in the experimental group were shown two movies in which an adult talks to an infant in IDS and to an adult in ADS. To exclude the possibility that the toddlers learned local rules during the habituation phase, toddlers in the control group were presented the movies in which combinations of the register and the addressee are switched. After they habituated sufficiently, 4 test movies were presented. One movie was identical to one of the habituation phase. In the other movies, the register or the speaker or the addressee paired with the identical trial was switched.

Preliminary results show that the experimental group toddlers (n=12) looked the addressee switch trial significantly longer than the identical trial. Moreover, because the results of the control group (n=10) show no significant difference between trials, it wouldn't be considered that the experimental group toddlers learned local rules during the habituation phase. These results suggest that although Japanese-learning toddlers associate the register of IDS and ADS with the addressee, their understanding is immature.

## PA-027
## Semantic processing of action outcomes in preschool years

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The functional relationship between comprehension and execution of goal-directed behaviour informs early expectations about future events. Young children and even infants appear to flexibly integrate contextual information in their understanding of action events and use this knowledge to guide their own actions. Recently, ERP components that are typically associated with the construction of meaning within the linguistic domain, have spoken to the build-up of meaning in action comprehension. In this study, we investigated preschool children's electrophysiological responses to semantically incongruous event outcomes. Specifically, we asked whether distinct mid-latency components are evidenced in 3- and 5-year-olds ERP responses to non-

rational event endings, and whether this relates to pre-schoolers' explicit judgement of the congruence between actions and outcomes. We presented children and adults with video material of several action sequences carried out within a clearly interpretable event context. Half of the final actions of each sequence mismatched the anticipated event endings, in the sense that this final action was carried out incongruously to the preceding event context (as opposed to incongruence effects resulting from the use of contextually irrelevant objects or the violation of functional properties of the manipulated objects). EEG data was correlated with pre-schoolers' performance on a picture-matching task, in which actions and outcomes were matched based on their semantic relatedness. Results support the idea of a close link between verbal and non-verbal semantic processing.

## PA-028
## Minimal-Pair labeling can impact visual categorization in infancy

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Some studies have shown different responsiveness between monolinguals and bilinguals to phoneme changes (Bosch & Sebastián-Gallés 2003; Fenell et al. 2007; Sebastián-Gallés & Bosch 2009). Recently Feldman et al (2013) have shown that exposure to minimal-pairs (e.g. gutah-gutaw) affects vowel discrimination. Here we tested the hypothesis that in an audiovisual categorization task, minimal-pair contexts may induce a single visual category.We followed Plunkett et al. (2008) categorization task in a two labels condition. During familiarization, participants saw 8 animal drawings designed to induce two visual categories. Ten-month-old infants were simultaneously presented with 2 labels, which were minimal-pairs (MP) in experiment 1 (n=24) and non-minimal-pairs (non-MP) in experiment 2 (n=23). We are piloting a silent version (Experiment 3, n=16) and the non-MP condition with adults (Experiment 4, n=14). Language background included bilingual and monolingual environments.We calculated the proportion of looking time to each of the stimuli presented in the test phase. Preliminary results for the four experiments shows that participants looked significantly longer to the prototype than to the average stimulus. Interestingly, in the non-MP condition only bilingual infants (n=10) looked longer at the prototype stimulus (p=0.024). This difference did not reach significance for the monolingual group (p=0.344). The results closely parallel the single-label study in Plunkett et al. (2008) and indicate that participants tend to form a single category to solve this difficult task when MP are presented. However, in our study, when the labels are non-MP only bilingual infants (and also adults) are able to use this strategy.

## PA-029
## Studying negation and disjunction in early infancy using pupillometry

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While logical thinking constitutes an important part of human reasoning, its early development is yet to be understood. In this study we have focused on one core part of logic, namely negation based disjunction, and trying to investigate the underlying processes involved using pupillometry. In a context of face voice association, 5 and 10 month old infants were familiarized with an ambiguous situation in which they make a random hypothesis about which of the two cartoon faces presented to them is a female. This hypothesis is set to be negated or confirmed at a second stage, as they see one of the two faces with either a male voice as in the test condition or a female voice or a silence as in the control conditions, and finally they are prompted to make a disjunction inference to find the female face. At the age of 10 month, infants significantly make the correct association compared to the control group. Pupil dilation is evident in hypothesis formation as well as cue presentation and the inference.Furthermore there is a higher pupil dilation during the final inference compared to the silent cue condition in which subjects make no decision.Also pupil dilation during the presentation of the cue in the test condition is correlated with the upcoming performance, which suggests that the observed dilation is elicited by the negation process. 5 month old infants show similar pattern in pupil dilation although with a lower performance. The results are also contrasted with an adult group to further compare the timing of negation and the inference based on the dynamics of the pupil dilation.While pupil dilation has been used recently in adults to describe the decision process, here we made an attempt to use it for describing the process of disjunctive inference in early infancy.

## PA-030
## Six-month-olds preferentially attend to objects that can change by themselves

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In the previous research we showed that self-induced change facilitates learning feature-sequences in preschoolers and 14-month-olds. (Haman, 2010, Hernik & Haman, BCCCD, 2010). In the current study we show that these effects may have earlier developmental roots. Thirty-two 6-month-old infants were familiarized with a series of looped alternating 3-D animations showing two objects undergoing a radical transformation (each became fully covered by bubbles emerging from within the object). For one object each bubble emerged upon contact a poking rod (externally-induced transformation), while for the other object the bubbles emerged even though the rods never actually touched the object (self-induced transformation). Four object shapes and two colors were used and systematically rotated across patterns of change. After familiarization children watched four test trials during which both static objects were displayed laterally on the screen. Visual preference for one of the objects was determined as a proportion of the totals of looking times for each object. Significantly more children looked longer at object that used to undergo self-induced transformation (two-tailed binomial $p<.05$). Thus 6-month-olds attend to the causal bases of the transformations (self-induced vs. externally-induced), map them on the transforming object, and preferentially attend to objects that can change by themselves.

## PA-031
## The psychological principle of non-contradiction: A fundamental underpinning of infants' theory of mind

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Two studies test infants' grasp of what we call the "psychological principle of non-contradiction". This principle specifies that a single mind is unlikely to maintain contradictory beliefs or goals, i.e. mental states co-referring to the same state of affair, while having mutually exclusive contents. Study 1: The case of actions. In a looking-time study, 9-month-olds' evidence a stronger tendency to expect two hands to belong to two people when one of these hands prevents the second one from achieving her goal, than when these hands

exhibit the same pattern of movements without identifiable goal. Therefore infants expect that a single individual is unlikely to aim for 'p' and 'not-p' at the same time.Study 2: The case of beliefs. In Study 2, fifteen-month-olds have to find a toy hidden in one of two locations, using the pointing of adult informants. When a single informant points successively to two different locations to indicate the toy's location, 15-month-olds follow her second pointing. Infants seem to recognize that the informant changed her mind, and is unlikely to disagree with herself (by believing a single toy to be in two different locations). Infants' tendency to trust the second pointing is reduced when the first and the second pointing are produced by two different informants. Infants appear to assume that the two informants maintain contradictory assertions about the toy's location, presumably because they recognize that two different people can have contradictory beliefs.

## PA-032
## Emotional faces affect infants' pupil dilation irrespective of conscious perception

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Detecting others' emotions is a crucial building block of social interactions. The underlying neural mechanisms operate fast, efficiently, and – at least in parts – even in the absence of conscious awareness, both in adults (Whalen et al., 2004) and infants (Jessen & Grossmann, in press). However, it is not clear whether unconscious emotion processing in infants goes beyond differences in brain activation and can influence the autonomic nervous system as has been shown for adults (Tamietto et al., 2009). To investigate this question, we tested 7-month-old infants in an eyetracking paradigm, focusing our analysis on pupil dilation.We presented happy and fearful facial expressions for either 900 milliseconds (conscious processing) or 50 milliseconds (unconscious processing) followed by a neutral face as a mask. We observed larger pupil dilation following happy compared to fearful faces, irrespective of stimulus duration ($F(1,19)=5.835$, $p=.026$).Our data therefore provide evidence for an increased attention to happy facial expressions, as suggested by an increase in pupil size. This was not only the case when infants consciously perceived happy facial expressions, but also when they were looking at neutral faces that were only preceded by a happy facial expression which they had not consciously perceived. Unconscious emotional stimuli thus not only affect infants' brain responses, but also their autonomic responses.

## PA-033
## Preschoolers spontaneously form a line when accessing a limited resource

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When distributing resources, one often has to balance self-serving and group-serving motives. With material resources, children show preference for equality very early (Geraci & Surian, 2011); however, overcoming self-interest when sharing goods is challenging (Smith et al., 2013). The current study examines children's group decision-making and behavior with a resource limited in time -- a situation that requires not only fairness understanding, but additional coordination skills, including the ability to influence others in the group. Children of two ages (3-, 5-year-olds; N = 160) participated in groups of four. After being trained individually to watch short videos in a movie viewer (a box with a small peephole), four children were given access to the viewer simultaneously. We measured whether, and how, children formed lines and took turns; how watching time was distributed among the group members; and we coded various characteristics of children's task-related actions and utterances. Preliminary results suggest that all groups of 5-year-olds, and most groups of 3-year-olds, eventually organized themselves by forming lines. Older children formed and maintained longer lines than younger children. Older children's actions also tended to be more group-oriented, and included more normative language, than those of younger children. Across ages, group-oriented actions were more successful than self-oriented actions, and were correlated with a more evenly distributed watching time. Thus, children start using complex coordination strategies such as forming lines and organizing others already at age 3; over preschool years, these abilities become increasingly more normative and informed by the interests of the group.

## PA-034
## Could fine motor skills predict early gestural development and vocabulary size?

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Infants' use of pointing gestures at 12 months is an essential developmental milestone (Liszkowski & Tomasello, 2011) predicting further communicative and vocabulary development at later ages (Ozcaliskan & Goldin-Meadow, 2005; Colonnesi et al. 2010). However, development of early fine motor skills in emergence and frequency of pointing have not received much attention. By longitudinally studying infant's pointing behaviors and fine motor development at 8, 10 and 12 months (35 infants: 15 females), we found that 10 month old infants scoring higher on Fine Motor Scale (Mullen, 1995) were more likely to become full-blown index finger pointers by the age of 12 months. When we hierarchically regressed index finger pointing frequencies of infants at 12 months first on their index finger pointing frequencies at earlier time points and later on their fine motor scores, fine motor skills of infants had an effect above and beyond the effects of earlier index pointing frequencies of infants. We further found that 8 month old infants who scored higher than their age-mates on Fine Motor Scale had larger productive vocabulary size for action-words at 12 months, as measured by CDI. However, this finding was no longer significant when we controlled for infants' index finger pointing frequencies at earlier time points. These results are likely to suggest that development of fine motor development parallels the achievement of early socio-communicative variables, but one should be cautious while drawing a causal link between the two domains.

## PA-035
## Metacognition of perceptual processing in infancy

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According to higher-order theories of consciousness, conscious perceptual processing depends on metacognition, i.e. on cognitive processes that evaluate the quality of the perceptual process. In this way, the presence of a metacognitive process is linked to the presence of conscious perceptual processing. With the aim of studying metacognition and conscious processing in infancy, we designed a masking paradigm that uses eyetracking to measures behavioral changes associated with metacognition. Infants were presented with a face gazing in the direction of an incoming visual reward. This cue was presented with two levels of masking. On low masking trials, the cue was clearly visible, while on high masking trials, the duration of the cue was at threshold, making difficult to perceive it. Another factor manipulated was the delay for the appearance of the reward. On the majority of the trials the reward appeared at a fixed time shortly after the disappearance of the cue, while on some test trials it appeared with a longer delay. Preliminary data shows that in these delayed reward trials, the level of masking modulates how long infants wait for the reward. In low masking trials, when the cue is easier to see, infants spend more time looking at the location where the reward will appear. On the contrary, in high masking trials, infants spend less time waiting for the reward. These results indicate a higher confidence in the low masking trials. The fact that infants confidence is modulated by the quality of the cue presented implies that they are able to perform a metacognitive evaluation of their perceptual processes; which is only possible if the perceptual processes are conscious in nature.

## PA-036
## Normativity in middle childhood: Social norms prime cooperation and selfishness in 6-11 year-olds

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Cooperation varies considerably across societies (Henrich et al., 2010) and this variation begins to emerge in middle childhood (House et al., 2013), perhaps due to children developing a greater sensitivity to local social norms that govern socially appropriate cooperative behavior. Here we study the role of social norms in prosocial development by exploring how 6-11 year-old German children's cooperative decisions are influenced by providing them with prior information about normative choices. Before making a binary choice between a Prosocial option or a Selfish outcome in a Dictator Game, children observe a video priming them with which choice is socially normative. Between subjects, the prime takes the form of one of three kinds of normative information: which choice is moral, which choice follows a rule, or which choice is most common. In

a control, no normative information is provided. Multilevel logistic regressions are used to analyze preliminary data from the study, and results suggest that with increasing age German children become more biased by the information in the normative prime (i.e., they become more prosocial when 3/3 is the normative choice, more selfish when 5/1 is normative). However, the results also suggest that there are substantial differences in how the different kinds of normative primes bias children's cooperative choices during middle childhood. This result will provide insight into the influence of normativity in prosocial development during middle childhood.

## PA-037
## Coherence in Preschool Children's Narratives and the Development of Cognitive Skills

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Building coherent discourse is an important achievement in preschool children's communicative and cognitive development. We examine the development of narrative skills in a longitudinal study of 4-5 year olds learning Bulgarian. Three categories of discourse connectives (adversative, temporal, and causal) are a valuable coherence building device exploited by young children. According to a recent theoretical account (Evers-Vermeul & Sanders, 2009), they are acquired in a certain sequential order as determined by cognitive complexity. We examine children's narratives of a well-known fairy tale against the background of a battery of concurrent (at the age of four) and subsequent (at the age of five) tests for communicative and cognitive development. Children's frequency and range in using connectives at the age of 4 were found to be in a moderate positive correlation with their receptive vocabulary at 5. The relationship with cognitive development, working memory (WM) in particular, was less straightforward. The range of connectives correlated positively with WM measured at the same age. However, we found moderate correlations between their use of connectives at 4 and their WM scores a year later that went in divergent directions. Whereas use of adversative connectives (e.g., 'but') was associated with better WM, the use of temporal connectives (e.g., 'and then') was correlated with worse WM performance. These findings emphasize the interplay and co-emergence of communicative and cognitive skills in preschool children.

# POSTER SESSION B

## PB-001
## What are you like, and what did you do? Person perception in preschool children across two cultures

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The task of forming impressions of other human beings tends to be effortless, even obligatory, for adults. By comparison, impression formation – specifically, the process in which personality trait information is (a) inferred based on observations or hearsay regarding others' behavior and (b) subsequently retained – is relatively understudied in young children, especially in a cross-cultural context. Across two experiments, we investigated impression formation in 178 European American and Taiwanese Chinese preschool children aged 50 to 78 months. In both cultures, children could infer basic personality traits (i.e., nice, mean) about unfamiliar informants from behavioral information, even when they were not explicitly prompted to do so. Participants could also distinguish between informants they had seen and those they had not seen before. Initially, memory for the inferred traits appeared to be stronger than memory for the behavioral information. However, after the difficulty level of the behavioral recall task was reduced in the second experiment, children were able to identify the original behaviors with much higher accuracy. Lastly, participants were largely able to predict how the informants might behave in the future, even when they had not previously verbalized trait labels consistent with the informants' past behavior. Other characteristics of the informants (e.g., gender) had little consistent impact on children's memory for the behavioral and trait information. In summary, our results indicate that across two different cultures – one Western, the other Asian – the ability to make behavior-to-behavior predictions via an intervening trait inference is robustly present for basic traits at an early age.

## PB-002
## Are cognitive variables associated with children's prosocial behavior?

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Prosociality is of great importance for humans, being essential for building and maintaining relationships with other people. It can be studied by using economic games, which shed light on how people share resources with one or more partners and how they react to unfairness displayed by others. The Ultimatum Game allows one player to share resources with a partner who can either accept or decline the offer. The Public Goods Game is played by groups of people who can choose if and how much to invest into a public good which is divided equally between all players involved. While there have been various studies with adults using these specific games, studies with preschool children are rare. Even less is known about the relationships between prosocial behavior and cognitive variables such as intelligence and mathematical abilities. Some studies with adults suggest that such relationships exist, but it is yet unknown whether this is also true for children. Therefore, we conducted two studies with 4- to 6-year-old children to investigate whether there is a relationship between their acceptance of various fair / unfair offers in an Ultimatum Game and their behavior in a Public Goods Game on the one hand and general intelligence, mathematical abilities, Theory of Mind, and the ability to delay gratification on the other hand. The results were not as straight forward as expected. Nevertheless, some interesting findings emerged that require further investigation.

## PB-003
## Developmental change of theory of mind in adolescence and adulthood

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Developmental change of Theory of mind (ToM) in adulthood is rarely explored, compared to that in infancy and childhood. This study was conducted to investigate the developmental change of ToM in adolescence and adulthood and its relation with cognitive abilities. We investigated 115 participants consisting of five age groups; college students of twenties, young adults of thirties, middle-aged adults from 40 to

64 years of age, early old-aged adults from 65 to 74, and late old-aged adults aged over 75 years. ToM performance was measured by ToM stories concerned white lies, irony, mistakes, and faux pas (Baron-Cohen et al., 1999; Happé et al., 1998). Control stories in which the understandings of mental states of characters were not required were used in order to compare the performances of Tom and control stories. Language ability and executive function were measured by the vocabulary test of Korean version of WAIS (Wechsler, 1981) and Stroop test. The control stories scores didn't differ across age groups. In contrast, ToM scores of early and late old-aged adult groups were declined compared with those of adolescent group, but were not significantly different from those of young-aged and middle-aged adult groups. This result suggests that ToM has been fully developed during adolescence and then declines during adulthood but remains relatively constant throughout adulthood. There were no significant group differences in vocabulary scores, but the Stroop test scores of early and late old-aged groups were lower than those of the other groups. The vocabulary scores correlated positively with the ToM scores, and the Stroop test scores correlated negatively with the ToM scores. Group differences of ToM scores among 5 age groups approached the significance level after the vocabulary and Stroop test scores were controlled.

## PB-004
## Linking cognitive affective flexibility with individual differences in trait anxiety during preadolescence

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Cognitive flexibility represents a hallmark of human cognition. This ability allows us to adjust our thoughts and actions to an ever-changing environment. The present study investigates the development of cognitive affective flexibility in 120 preadolescents aged between 10 and 15 years (M=12.93, SD=1.06 years). Our major aim was to assess children's ability to flexibly shift between non-emotional (geometric shapes) and emotional (emotional facial expressions) stimuli in relation to individual differences in trait anxiety. In order to measure cognitive flexibility, as well as look at any emotion-related effects, we used the standard Flexible Item Selection Task (FIST) and designed

a modified version of this task which includes emotional stimuli (EM-FIST). Our results reveal that children performed significantly better on the FIST as compared to the EM-FIST (in terms of both accuracy and response times). Moreover, trials that demanded greater flexibility (flexible trials) were more taxing on cognitive resources than trials that lacked this need for flexibility (inflexible trials) in both versions of the FIST. Looking at individual differences in trait anxiety, our results suggest the possibility of a detrimental effect of anxiety on reaction times specific only to trials that required greater flexibility in the EM-FIST version.

## PB-005
## Is it real? Perceptions of taxidermy in museums of natural history

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Natural History Museums (NHM) are popular visitor attractions, providing physical encounters with real, authentic specimens from across the globe. However, why visit NHMs when virtual copies are readily accessible? (Leinhardt & Crowley, 2002). Museum professionals believe that face-to-face experience with actual specimens creates 'awe-inspiring' reactions and aesthetic experiences unique to a museum visit, thus it is surprising that almost no empirical research has examined perceptions of NHM objects. The current study assessed whether children and adults judged taxidermy as 'real' and museum worthy. Participants took part in one of two conditions to reflect the way taxidermy is curated in museums: touchable or encased. A third condition aimed to increase perceptions of the real, authentic nature of taxidermy by presenting it with a toy version of the same animal (a rabbit), following a method used by Bunce and Harris (2013). Four age groups took part: 4-5-year-olds (n=66), 6-7-year-olds (n=67), 8-10-year-olds (n=61) and adults (n=34). All participants were visiting Oxford University NHM. The extent to which the taxidermy rabbit was judged as real and museum worthy increased with age and was greatest when compared to a toy rabbit, but there was no difference in judgments in the encased and touchable conditions. Participants' justifications were allocated to one of three categories: Properties (e.g., "It has real fur and real actual ears"), Life (e.g. "It was alive before it died"), and Miscellaneous. There was an increase in the number of property justifications with age and more were produced in the toy condition. In contrast, there was a general decrease with age in the number of life justifications, and fewer were given in the toy and touchable conditions. Implications for the development of children's understanding of what is 'real' and for facilitating children's museum learning are discussed.

## PB-006
## Do children trust an expert or the crowd when learning normative and instrumental skills?

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When a child is acquiring a new skill, the most adaptive strategy should be to learn from the best source. However, context may influence which source is better. In an instrumental context, an expert may be the best informant. In a normative context, copying majority consensus may be better. We examined whether children preferentially copy a highly competent individual versus a majority in instrumental versus normative contexts.In experiment 1, children were assigned to an instrumental or normative condition. During test trials, children watched a previously competent and a previously incompetent model demonstrate a different action on two novel puzzles. In the instrumental trials, children watched each model try to get the prize out. In the normative trials, children watched each model "fepp/blick." Following the videos, children were told it was their turn to get the prize out (instrumental) or to fepp/blick (normative). Results suggest that 4-to-7-year-olds selectively trust a more competent individual over an incompetent individual.In Experiment 2, we investigated whether children selectively trust a neutral majority versus a competent model in normative versus instrumental contexts. Six-to-7-year-olds were more likely to copy either the majority or the expert than to be ambivalent. Four-to-5-year-old's responded randomly in the instrumental condition, but consistently chose one or other strategy in the normative condition. Results from Experiment 1 showed that children trust a more competent individual in both contexts. When faced with a consensus versus a competent individual, individual children expressed different but consistent preferences. The causes of such differences beg further study.

## PB-007
## Focusing and shifting attention in human children and chimpanzees

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Humans are confronted daily by situations which require the ability to coordinate co-occurring tasks, and to simultaneously pay attention to the demands of the activities being executed as well as other stimuli, focusing on what is most relevant and filtering out what is extraneous. Even if such flexibility in action and attention is advantageous for any species, humans seem unique in the degree of flexibility demanded and the prevalence of situations which require such coordination. In two studies, we compared 4- and 5- year- old children and one of humans' nearest relatives, chimpanzees, in their ability to focus and shift their attention when necessary. The results of Study 1 showed that 4-year-old children and chimpanzees were very similar in their ability to monitor two identical devices and to sequentially switch between the two to collect a reward, and that they were less successful at doing so than 5-year-old children. In Study 2, which required subjects to alternate between two different tasks, no species or age differences were found.These results suggest that chimpanzees and human children share some fundamental attentional control skills. However, this study also suggests that such abilities gradually develop during human ontogeny and result in the uniquely human ability to monitor and shift attention between a large numbers of simultaneous tasks.

## PB-008
## Gender, socioeconomic status and prereading skills

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The association between phonological awareness (PA) and non-cognitive variables such as socioeconomic status (SES) and gender has been widely studied. The relationship between PA and SES is still unclear (Purall-Gates, 2008). Some research claims that there is no connection between PA and SES (Noble, Farah & McCandliss, 2006) Nevertheless, others pointed out that higher SES results in an increased phonological awareness performance (Vloedgraven, 2008). In addition, Lundberg, Larman & Strid (2012) found significant gender difference in PA acquisition. However, research regarding the

relationship between letter-sound correspondence (LSS), perception and identification of orthographic patterns (PIOP) and these background variables is scant.Thus, the aims of the present study are to examine the development of PA, LSS and PIOP from Grade 1 to 4 and the relationship between gender and SES and Hungarian students' performance of prereading skills. Students (N=205) were administered an online prereading skill test battery (84 items) and a background questionnaire (70 items) by means of an online platform. Mother's educational level was used as a proxy for SES.Data show that PA developed significantly between the 2nd and 3rd grade ($F=22.39$ $p<.01$), performance on PIOP and LSS remained unchanged between the grades ($F_{PIOP}=3.97$ $p<.05$; $F_{LSS}=2.57$ $p>.05$). There were no significant gender differences in PA and LSS but in case of third graders' PIOP boys outperformed girls. LSS and PA correlated significantly with SES ($r_{LSS}=.19$ $p<.01$; $r_{PA}=.35$ $p<.01$).In sum, the influence of SES on two of the most influential prereading skills appeared during the period of learning to read. Gender differences only occurred in PIOP. Further analysis is needed to determine the exact constituents of SES contributing to the prevalence of this relationship. The lack of achievement gap in terms of gender may facilitate the better understanding of the achievement disparity between boys and girls in reading comprehension.

## PB-009
## Naturalistic social learning in infancy: the case of plants

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For humans living in naturalistic environments, plants are central to everyday life as sources of food, raw materials for artifact construction, and their underlying chemical properties (e.g., medicines and poisons). However, because the features of edible and poisonous plants vary widely, employing a general strategy that all plants are edible (or poisonous) would be extremely costly. This poster will present a series of recent studies examining whether humans possess evolved social learning mechanisms that balance the costs and benefits associated with plants.

The first set of studies investigates the protective behavioral strategies infants employ prior to receiving social information about a particular plant. These studies show that 8- to 18-month-olds show a striking reluctance to reach out and touch plants compared to other types of entities, a strategy that would protect them from the type of harm that plants inflict (poisoning, physical injury). A second set of studies demonstrates that 6- and 18-month-olds engage in selective social learning of plant edibility. Specifically, infants treat the same

social information--an adult placing something in his mouth--as indicating edibility when it is applied to plants, but not man-made artifacts. Finally, a third set of studies examines the learning rules that infants use to extend social information about edibility to novel entities. After witnessing an adult eat fruits from an exemplar plant, 18-month-olds reliably consume fruit from a novel plant that shares features with the exemplar plant (leaf shape, fruit color) over a different novel plant that does not share those features. Taken together, these results (i) suggest the presence of evolved social learning mechanisms that allow humans to cope with the problems posed by natural environments and (ii) have broader implications for the evolution of learning mechanisms and the generation of human culture.

## PB-010
## Is 2+1 easier than 1+2? A cross-cultural study with preschoolers in Sri Lanka and Germany

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In light of Wynn's (1992) finding of intuitive numerical competencies in infants, preschoolers' numerical abilities seem comparatively weak if assessed in verbal tasks (e. g. Houdé, 1997). This discrepancy might be explained by a cognitive-verbal reorganization disrupting the utilization of core knowledge. Evidence for this comes from a language-specific singular-plural bias affecting young children's numerical representations in languages such as French and Spanish, but not British or Finnish (Lubin et al., 2006). In the former languages, the number word for "one" resembles the indefinite article(s), causing young children to accept outcomes of addition events as correct if any number of objects added to a single object results in multiple objects, because – according to their verbal reasoning – a singularity becomes a plurality. However, a 2+1-task – as two is already a plurality – can help children to overcome this obstacle.These findings inspired our present study: A cross-cultural comparison of children's (aged 25-71 months) performance in the 2+1- vs. 1+2-tasks in Germany and Sri Lanka was conducted. In both languages spoken in Sri Lanka (Tamil and Singhalese) indefinite articles exist only in the written language. In contrast, in the German language the singular indefinite articles resemble the number word for "one" closely.Contrary to the language-bias hypothesis no significant task effect was found in either language group. Although the cultural comparison did not reveal the predicted task difference, the Sri Lankan children performed significantly better overall than the German children.

## PB-011
## Preschoolers use common ground in their justificatory reasoning with peers

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Reasoning to reach a joint decision is a complex social skill, which requires children to track the knowledge states of their partners and the common ground that they share with them. In this study, we investigated whether pairs of 3- and 5-year-olds (N=146) were able to adapt the informativeness of their arguments to the common ground that they share with their peers. The children were introduced to a novel animal with unique characteristics (e.g. eating stones). We manipulated whether they share the knowledge about the animal with their peer and whether they were aware of their shared knowledge in three conditions. In the common ground condition, both children learned about the animal together and were aware of their shared knowledge. In the one-expert condition, only one child learned about the animal while the other remained naïve and they were ignorant of one another's knowledge state. In the two-experts condition, both children learned about the novel animal independently, such that they were unaware of their shared knowledge. Later children were asked to collaboratively decorate a zoo cage for the novel animal by choosing three items the animal might need. Children of both age groups used informative arguments mentioning the unique characteristics of the animal to justify their decisions significantly more often in the two conditions without common ground than in the common ground condition. This suggests that by age 3, children are able to flexibly use common ground to determine what kinds of reasons justify their joint decisions in peer interactions.

## PB-012
## Children with asperger's syndrome spontaneously track others' beliefs

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Previous research suggests that autistic children's and adults' impairment in social interactions might be due to a lack of a tracking others' mental states. Although autistic children can pass explicit verbal false-belief tasks, they do so much later than do non-autistic children. Furthermore, although adults with Asperger's

syndrome pass explicit tasks, they fail to demonstrate an implicit understanding of others' beliefs. Therefore, children with autism seem to learn behavioural rules that enable them to give correct answers when being asked to predict another person's behaviour explicitly. In the current study we presented children with Asperger's syndrome (N=20) with three versions of an avoidance false-belief task. In the explicit version, participants had to predict a protagonist's behaviour. In the implicit violation-of-expectation version, we measured participants' looking time at a protagonist's belief-congruent and belief-incongruent behaviours. Finally, participants did a task in which the protagonist's beliefs were manipulated but were irrelevant for solving the task. Since avoidance false-belief tasks are less restricted in their possible outcomes than ordinary change-of-location tasks, as expected, participants failed not only the implicit but also the explicit task. However, in the task designed to measure an automatic attribution of beliefs, participants' performance was influenced by the protagonist's beliefs. These results not only suggest that autistic children's and adults' success in explicit tasks derives from compensatory learning. More importantly, they show that they fail implicit false-belief task not because they do not track others' beliefs but because they lack an understanding of the determining nature of beliefs on behaviour.

## PB-013
## Sense of body ownership in school-aged children

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The rubber hand illusion has commonly been used to investigate the foundations of self-consciousness by tricking people's mind in believing that they are owning a fake hand lying next to their real hand. To explore the role of vision in building a sense of self in children, we tested 8-9 years old children and a group of adult controls on a somatosensory version of the rubber hand, in which individuals are blindfolded while the experimenter moves the participant's right index finger along the rubber hand and simultaneously strokes the left hand of the participant.

On questionnaire data, we found that children rated the fake hand to be theirs following both synchronous and asynchronous stroking of the fake hand and real hand, suggesting that subjective sense of body ownership is strongly influenced by temporary lack of sight in children. Indeed, adults reported to perceive the rubber hand as their own only during simultaneous stroking.

Interestingly, when asked to point towards their own hand, both children and adults mislocalised the position of their own hand towards the rubber hand in the synchronous but not asynchronous condition.

Our results show a dissociation in children aged 8-9 years between sense of body ownership and remapping of touch in external coordinates in the somatosensory version of this bodily illusion.

## PB-014
## Developments in infants' working-memory capacity in the second year of life

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Studies of early working-memory capacity indicate that by their first birthday, infants can represent and update two small sets of hidden objects when (1) each set is created one at a time and (2) spatiotemporal information can be used to individuate the objects in each set. Our research examined whether 20-month-olds would succeed at a preferential-reaching task where (1) the two sets were created in alternation and (2) only featural information could be used to individuate the objects in each set. In Experiment 1, infants sat across from an experimenter (E) at a table on which rested two large boxes; one contained two objects (e.g., bunnies) that differed in pattern, and one contained two objects (e.g., bottles) that were identical. E lifted and lowered one object from each box in alternation, and then she repeated these actions (e.g., bunny-1, bottle-1, bunny-2, bottle-2). Next, E removed one object from each box, and then she slid the boxes toward the infant.Infants reached preferentially for whichever box had initially held two distinct objects, suggesting that they (1) used the available featural information to individuate the objects in each box, (2) updated these representations after objects were removed, and (3) expected that one box still held an object, but that the other box was now empty. This finding was confirmed in Experiment 2.

These and other findings reveal important developments in the second year of life in infants' working-memory capacity; ongoing experiments are testing younger infants to determine precisely when these developments occur.

## PB-015
# Children's understanding intention of teaching in Korean

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Teaching can be defined as an intentional activity to enhance the knowledge states within the framework of theory of mind. This definition seems to be contrasted with the functional definition of teaching which does not require of understanding an intention: learning could occur by imitation. The intentional definition emphasizes on understanding an intention in teaching activity. It is further argued that children's intentional understanding of teaching could be related to false belief understanding. This study examined Korean children's understanding an intention in teaching and its relation to false belief understanding. Forty 3-and 5-year-old children were tested. The teaching task includes 4 different stories (i.e., successful teaching, failed teaching, successful imitation, failed imitation). The teaching and imitation stories could be distinguished in terms of whether there was an intention to teach or not. The outcome could be either successful or failed. Children were asked whether the agent in each story has an intention to teach. False belief understanding was assessed using 3 unexpected location tasks. The finding indicated that 3-and 5-year-olds both reported an agent's intention to teach in the teaching stories and did not distinguish the successful outcome from the failed outcome (i.e., 88.3% in 3-year-olds and 85% in 5-year-olds). However, there was an age difference for inferring an agent's intention in the imitation stories. 5-year-olds reported the intention to teach less frequently that 3-year-olds did ($t(38)=3.78$, $p<.05$). It suggests that there was some developmental change in understanding of teaching. This study also examined the relation between understating of teaching and false belief. The results revealed that only understanding of imitation was related to understanding of false belief ($r=.35$, $p<.05$). We will discuss the results in terms of theory of mind.

## PB-016
## Mirror-touch stimulation may increase the emotion reading in children

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Recent studies have found evidence that the multisensory stimulation on body-awareness can be extended to face involving the self-other recognition process. Seeing someone else's face being touched at the same time as one's own face elicits changes in the mental representation of the self-other boundary and increases the emotion (especially fear) recognition in adults (Maister et al, 2013). Here, we examined this illusion from a developmental approach, because until now we know very little about the early process of the emerging multisensory integration in childhood.

In our study 80 children (aged 3-, 4-, 5-, and 6-years) saw an unfamiliar face touched synchronously or asyncronously while feeling touch on their own face. We tested whether the synchronous multisensory stimulation facilitates the reading emotion of others (happy, fear, disgust). The findings supported that synchronous multisensory stimulation (feeling touch on one's own face with observed touch on someone else's face) elicit changes in self-other boundaries, and facilitates the recognition of emotions comparing to asynchronous stimulation. Furthermore we found developmental shift between age of 3 and 4 years. Our findings support that the shared multisensory experiences between self and other, even in childhood, can change the perceived similarity of others relative to one's self which resulted a better emotion recognition.

## PB-017
## Neural correlates of perceptual narrowing for adult faces in the first year of life

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It is known that, by 9-12 months, infants' discrimination abilities tune towards face categories that are most frequent and relevant in the environment, with relevant categories including species (human vs. non-human), race (own-race vs. other-race), gender and age (adult vs. newborn/child). Research investigating the neural signature

of this developmental process -i.e., perceptual narrowing- is limited, and suggests that perceptual tuning translates between 6 and 9 months into increased specificity of infants' electrophysiological responses to human faces and own-race faces. Here we investigated the neurophysiological counterpart of perceptual narrowing toward adult faces by measuring event-related potentials (ERP) evoked by upright and inverted adult and child faces in 9-month-old infants (N=16) without an older sibling and with limited experience with children. Face age and orientation were tested within-subjects, and the extent to which each factor modulates the latency/amplitude of infant face-sensitive components (P1, N290, P400) was measured. The latency of the P1 and the amplitude of the N290 were modulated by stimulus inversion for adult faces but not for child faces, indicating specificity of infant ERP responses to adult faces. The extent to which such specialization is modulated by perceptual experience is currently under investigation through the testing of a second group of 9-month-olds who, from the time of their birth, have been exposed to the face of an older sibling whose age at participants' birth ranged between 3 and 6.

## PB-018
## The effectiveness of two acute physical activity interventions on inhibitory control of preschoolers

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Physical activity is an important health factor. However, it also seems to be connected to cognitive functions. Despite the vast amount of research on the relationship between cognition and motor function, there are – especially for preschoolers – just a few experimental designs. Hence, it is still unknown which kind of physical activity is the most effective to facilitate cognitive functions or which kind of cognitive function profits most from physical activity. The aim of the present study was to explore the effectiveness of two acute physical activity interventions on the inhibitory control of preschoolers. Children were distributed into three groups, an endurance training group, a coordination training group and a control group. Every group performed four different tasks once within 15 minutes. The coordinative group performed bimanual tasks (e.g., throwing balls with both hands alternately). The endurance training group carried out running and cycling tasks, whereas the control group fulfilled physically undemanding tasks (e.g., stamping pictures). To control the intensity of the interventions, the children wore a heart rate monitor. For both physical activity groups a mean heart rate of about

140 beats per minutes was defined as target heart zone. Inhibitory control was tested one week before and immediately after the intervention with a modified Flanker Task (Roebers & Kauer, 2009). The results revealed that children who participated in one of the physical activity interventions showed a significant gain in inhibitory control. Additionally, the effect of the interventions for children with low-inhibitory control at pretest will be discussed.

## PB-019
## Does bilingualism influence the way infants pay attention?

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Past literature has shown differences in attention-related measures between monolinguals and bilinguals, even during the first years of life. For infants the need to keep the two language systems separate would result in the use of different learning strategies. Such differences might be related to mechanisms underlying focusing attention on relevant cues and ignoring irrelevant ones (Sebastian-Galles et al, 2012). Here we wanted to investigate this difference in a purely visual attention task. To this end, we tested 15-month-old monolingual and bilingual infants (15 in each group) and 18-month-old monolingual and bilingual infants (19 in each group) in a gaze contingent paradigm adapted from Wass et al (2011). In the study infants had to follow the movement of a butterfly. The study consisted in 9 screens increasing the number and attractiveness of the distractors. The results showed that more monolingual infants than bilingual ones followed the butterfly up to the last screen, both at 15 months (67% vs 53%) and at 18 months (68% vs. 47%). The results support the notion of an impact of bilingualism on the development of attention, but they also point in the direction of a complex relationship.

## PB-020
## Reality, fantasy, and culture in a sample of Iranian children

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Children typically learn about the important historical and fantastical figures in their culture in the context of stories. Previous research with middle class American children suggests that the ability to distinguish between historical and fantastical figures develops between the ages of 3 and 5 as a result of children's emerging ability to make inferences about causal events (Corriveau, Kim, Schwalen & Harris, 2009). Recent work shows, however, that cultural factors such as religion, as well as cognitive factors such as belief representation, correlate with the ability to use causal understanding in judging the ontological status of characters (Corriveau, Chen & Harris, in press; Corriveau & Harris, in press). In the current study, we tested children in Iran (N=41 3-4 year olds and N=39 5-6 year olds) on their ability to differentiate between historical and fantastical characters in stories. Children in Iran have greater exposure to religion in their daily lives and show different patterns of theory of mind acquisition compared to children in Western cultures. Thus, we predicted that Iranian children would be more likely to show a "reality bias" – classifying fantastical characters as real – compared to children in the US. Iranian younger children showed a systematic reality bias, classifying historical figures as real, but also classifying fantastical figures as real. Older children showed some improvement in categorizing fantastical figures as fictional, but performed at chance levels. A comparison of the older Iranian children's performance with prior data on children in the US showed that Iranian children appear delayed in correctly identifying fantastical figures as not real, a persistence of the reality bias. I discuss these results in light of both the prevalence of religious stories in Iran and a replication of early knowledge access abilities found in this sample on a theory of mind battery.

## PB-021
## The role of facial features in 6- to 24-months old infants' preferences for prosocial behaviors

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Research has recently challenged the conception of infants as selfish beings, showing an ability of social judgment (what is good or bad) in infancy (Hamlin, Wynn, & Bloom, 2007). When watching interactions involving prosocial and antisocial individuals, infants at 6 months of age display a strongly preference for the one producing a prosocial behavior (helping, sharing).

To our knowledge, no study has investigated whether these preferences are modulated by preferences for facial features existing in early development, such as the well-known preference for own-race over other-race faces (Pascalis et al., 2005, 2007) or the preference for attractive over unattractive faces (Langlois, 1987).

Our research aims to determine the role played by facial features in infants' preferences for prosocial behaviors. We conducted experiments using eye-tracking (paired with a forced choice paradigm), a methodology never used till now to explore the aspects infants deal with when assessing social interactions.

Six- to 24-month-olds infants were shown cartoons in which a character was either the patient of an antisocial behavior (keeping the ball for himself) or the target of a prosocial behavior (sharing the ball). The antisocial character showed own-race face or symmetric face, whereas the prosocial character showed other-race face or asymmetric face.

Even though infants choose robustly the prosocial character no matter of the race, no preferences were found when we competed antisocial attractive character with prosocial unattractive character. These first results suggest that perceptual aspects of characters such as facial features influence social evaluation in infancy.

## PB-022
## Turn taking in chimpanzees and human children

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When sharing an undividable resource, turn taking is one strategy used by humans to solve this complex coordination problem. It still remains unclear if one of our closest living relatives, the chimpanzee, shares this mechanism yielding and maintaining prosocial behavior. Therefore, we compared chimpanzees' (Pan troglodytes) and human children's (5-year-olds) behavior in competing for a non-sharable tool needed to access a reward, which was provided separately for both subjects. 15 chimpanzee and 40 human children dyads were tested using a tug-of-war designed apparatus in which simultaneous tool use was impossible. The main two questions were if the tested subjects would reach an equilibrium solution considering their individual outcomes, and if they would take turns using the tool. The results show that 5-year old children reached an equilibrium solution and predominantly took turns repeatedly, whereas

in the majority of the chimpanzee dyads the individual outcome was unequal and turn taking infrequent. In the chimpanzee dyads, which gained an equal amount of food, one subject monopolized the tool. This suggests that immediate reciprocation, i.e. turn taking, might not be a commonly used strategy of chimpanzees to solve the coordination problem of limited access to an undividable resource, as it is in humans from an early age on.

## PB-023
## Basics of the number concept: Set correspondence in early childhood

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There is a debate, whether children understand the number-specific principles before they can count and understand how counting specifies the size of a set. Gelman and Gallistel (1978) proposed that there are innate number-specific principles that underlie the counting ability. Most of the researchers, for example Wynn (1990, 1992) argues against this statement, and the consensus is that children before uderstanding the counting do not understand the appropriate principles. Some task analysis (e.g., Russel (1920)), suggest that it is possible to understand some aspects of exact numerosity before being able to specify a value: one might understand that the property of numerosity is parallel with matching sets.

To measure whether this more simple concept of number is available for subset-knowers we use a “clothes washing” task in which we use pairs of large set of clothes (6 t-shirt and 6 trousers) and apply set operations. Some of the operations change the numerosity, while some of them do not. Preschoolers could track whether the one-to-one correspondence was changed by the operation, although the sets were too large for them to track the items or the specific values. This result shows that subset-knower preschoolers may understand an initial set of principles for understanding exact numerosity.

## PB-024
## How is human social dominance understood in 15- and 18-month-old infants?

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Little is known about the emergence of social representations such as social dominance during the first two years of life. Using geometrical figures as interacting social agents, Mascaro and Csibra (2012) showed that 15-month-old infants are able to understand social dominance (i.e., discriminate between dominant and subordinate agents in conflict situations). Moreover, they also demonstrated that 15-month-olds can use this information to predict which agent (i.e., the dominant) will prevail in future situations.

The goal of our experiment was to investigate whether infants exhibit the same skills in a more ecological situation, by using real human agents. We recorded 15- and 18-month-olds'eye gaze while watching silent videos of two female agents competing to reach the same goal. In the familiarization phase, infants watched repetitively two agents competing to grab a teddy bear. In each of the trial, the same dominant agent always prevails over the subordinate. In the test phase, the agents compete in a novel situation (i.e., to seat on an armchair). For half of the infants, the same agent remains dominant (Congruent condition) whereas for the other half, the previously subordinate agent prevails (Incongruent condition).The results showed that only 18- but not 15-month-olds (N=32 for each age, 16 per condition) looked longer in the Incongruent rather than in the Congruent situation. Here, only 18-month-olds generalized social dominance to a novel conflict situation. We further discuss the reasons why our results are slightly different than the one obtained by Mascaro and Csibra (2012).

## PB-025
## Children use a dispositional core concept when identifying causality

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Dispositional theories of causality assume that people associate causality intuitively with an interaction between an agentive cause-object and an effect-object involving an asymmetric impact of forces (see e.g., Mayrhofr & Waldmann, 2014, White 2013;

Wolff , 2007). Using a dispositional schema to deduce causality does not only effect if a situation is interpreted as causal independent of it being viewed objectively (e.g., White 2013), but even more so, it leads the observer to implicitly ascribe specific features (e.g. strength, dominance, goal-directedness) to the interacting objects, which in turn influences the types of intuitive theories and explanations that are used to interpret causal processes. Consequently, dispositional schemas have a large influence on conceptual development The application of dispositional schemas in children remains underdeveloped in academic research. Method. We investigated 7-year-old children (N=30) and adults (N=30) capacity to intuitively use a dispositional schema when watching a collision event. We presented them with an event inspired by Michotte's launching event (a toy car drives into a ball which then rolls away). They then heard a series of 30 statement-pairs that implied the causal roles of agent and patient with the specific attributes, and had to rate, by pressing a button, if the statements were right or wrong. In order to measure their intuitive concepts, adults had to answer under time pressure. Results. The results show that children and adults interpret a mechanical collision between two inanimate objects as an interaction between an agent and a patient. Contradicting objective physical occurrences, they assume asymmetric effects of forces and assign specific attributes to the interacting objects (e.g., strength/ weakness, winning/losing, goal directedness, dominance).

## PB-026
## Labels help preschoolers to memorize additional information about category, but only for global features based categories

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Numerous studies show that verbal labels help to launch new category formation (Deng & Sloutsky, 2013), or select specific information from memory for categorization (Gelman & Heyman, 1999). However, in many situations, children already have an initial knowledge about the category, but they obtain additional information within the experience and they need to relate it to the already known information. Do the verbal labels and content of initial knowledge affect on the memorizing of such additional information about the category? In the experiment, at first we asked preschoolers from 4 to 5 years to find artificial targets that differed from distractors by local feature (inner part) or global one (form). The participants were instructed to find target either by its

name (label condition) or by example (no-label condition). As soon as the target found, subjects were shown some additional information about this object: frequent features (so called "categorial") and rare features ("individual"). The additional information had to be memorized. After accomplishing that task, participants received a memory test. They were shown some old items and new items with changed "categorical" features. It turned out, that children indeed recognized test items better in the label condition than in the no-label condition, but only when the categories differed initially on global features. However if the target objects differed from distractors by local features, children recognized test items unsuccessfully both in the label condition, and in no-label condition.

## PB-027
## Emotion representation in securely and insecurely attached children in terms of social referencing phenomenon

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Following Gergely and Unoka (2008), we consider emotion representation's formation as consequence of child's referential attitude towards emotions manifested by adults. This supposes that development of emotional representation relates to attachment security. Remarkable evidence of emotional representation is social referencing phenomenon (Campos, 1983; Klinnert, 1984; Mumme, Fernald, Herrera, 1996). Studies concerning relation between social referencing and attachment are focused mostly on the matter of trust between adult and child (Dickstein, Thompson, Estes, Malkin, Lamb, 1984; Bradshow, Goldsmith, Campos, 1987), but they do not apply to the referential interpretation of the displayed emotion. In our study, we do bring attachment security into correlation with tasks on social-referencing judgment varying emotional context. Within procedure parent demonstrates to child unfamiliar toy expressing definite emotional attitude (pleasant, surprising or dangerous). Herewith, toys are selected according to emotions displaying by separate group (pleasant, surprising or dangerous) and are demonstrated in disconnected way (for example, "pleasant" toy is displayed as "dangerous" or "surprising"). In contrast to previous studies (Bradshow et al., 1987) we ask parents to express emotions in casual way, as they usually do in communication with their children thus keeping consistency of parent's behavior. Results show that after demonstration securely attached children more often display parent's emotion, whereas insecurely attached

children express the emotion caused by toy type. Interesting, that within described demonstration securely attached children more often look confused in comparing to insecurely attached children. Our report also discusses how revealed data relate to current issues of social learning within emotional development.

## PB-028
## Children attend to shared cultural knowledge when making social choices

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Children choose social partners based on various attributes such as race or language (e.g., Kircher & Furby, 1971; Kinzler, Dupoux, Spelke, 2007). However, it is unclear whether these choices rely on genuinely social factors: Children's preferences might reflect their sensitivity to agents' group membership. Alternatively, these preferences might reflect certain emotional biases (e.g., preference for the familiar or for the individuals who are perceived as similar to the self) that become linked to social groups only later in life. A particularly potent cue to group membership is shared cultural knowledge. In fact, for most of our species' existence, cultural knowledge was transmitted exclusively through social contact. Using music-based social choices, we asked whether children would preferentially choose their friends based on shared cultural knowledge, or rather based on shared preferences; a likely basis for perception of similarity to the self, yet a less informative cue about group membership.

Experiment 1 established that music modulates children's social choices: four and five year-old children (n = 24 per experiment) preferred other children whose favorite songs are familiar to them (i.e., popular American children's songs). Experiments 2-4 tested separately for effects of shared song knowledge and shared song preferences on children's social choices. Results showed that children's preferences are selectively driven by a shared state of cultural knowledge: When children had to choose a friend among two children who differed in terms of their knowledge of and/or of their preferences for a familiar or an unfamiliar song, children both preferred others who knew songs they themselves knew, and avoided others who knew songs they did not know, irrespective of the target children's preferences for the songs. Thus, young children have a selective sensitivity to shared cultural knowledge, likely a highly informative marker of group membership over the time scale of human evolution.

## PB-029

# Near and far from me: collision perception in newborns

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Immediately after birth, newborns are introduced within a highly stimulating environment, where many objects move around them, particularly within their Peripersonal Space. It would therefore be adaptive for infants to be able to discriminate which of these objects move towards them and could come into contact and interact with them. Previous research investigated the appearance of defensive blinking - identified as the best indicator of awareness to stimuli on a collision course in early infancy (Yonas, 1981) - and concluded that infants start blinking appropriately in reaction to visual stimuli at the age of 3 to 4 weeks (Nanez, 1998).

The present study aimed at understanding if newborns in the very first hours of life are able to discriminate between objects moving towards them on a collision course and others avoiding them. The experiment consisted of two conditions; during both of them we measured the looking behaviour of newborns who were presented with two videos showing the different movements. Under the first condition, they were shown with a ball moving towards them on a collision course and a ball receding from them, whereas under the second one, the colliding ball was paired with another one moving towards them but not on a colliding pathway.

Twenty newborns took part in the study (7 female, M=46.5 hours). Results outlined a main effect of the direction of movement and, in particular, showed that newborns in both conditions preferred looking at the ball moving towards them rather than the one avoiding them. Neither the condition nor the order of presentation appeared to influence looking times.

This exploratory study intriguingly demonstrate that newborns seem to be able to discriminate between movements happening within their Peripersonal Space. In particular, they showed to be more interested in movements directed towards them on a collision course.

## PB-030
## 12-month-old infants attribute agent's action goal to face

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We investigated the possibility that infants attributed agent's action goal to one's face. Human featural cues help infants to interpret entities as human agent. We focused face and hand as such cues, and examined which of agency cues infants attribute goal-directedness to 6-, 9-, and 12-month-old infants were tested by a modified version of Woodward paradigm. Infants were familiarized with actor's face and hand, which extended out from a screen to reach one of two objects. Then, in the test phase, the positions of objects were switched and the actor's face or hand was changed to another person's one (face change condition and hand change condition, respectively) and the actor reached each object alternately.The results showed that 12-month-old infants significantly looked longer at the new goal event than the old goal event in hand change condition. This looking pattern was also found in the result of 9-month-old infants, although it was marginally significant. 6-month-old infants showed no differential looking at each event in this condition. On the other hand, in face change condition, infants of all age groups did not show any significant difference in looking time for test trials.These results suggested that when identical face was presented, at least 12-month-old infants showed goal attribution even if actor's hand changed. In contrast, they did not attribute goal to actor's hand as long as the face changed. We propose that an agent's face rather than hand works as a cue of identity for goal attribution in 12-month-old infants.

## PB-031
## 14-month-olds' understanding of marker and knowledgeability in a hiding game

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There are studies giving evidence for the infants' understanding of what a person can or cannot see (e.g., Brooks & Meltzoff 2002, Luo & Baillargeon 2007, Poulin-Dubois et al. 2013, Sodian et al. 2007). However, it remains unclear whether infants are able to use other's perceptual access to make inferences about other people's knowledge.

Therefore, we investigate if 14-month-olds follow the suggestions of a puppet who can see how an object will be hidden in one out of two boxes more often than the suggestions given by an ignorant puppet. Within the warm-up trials the experimenter introduces the hiding game observed by the infant opposite to the experimenter. After hiding the object in one box (visible to the infant in warm-up 1, invisible in warm-up 2) the experimenter shows where the object is hidden by pointing at and placing a marker (wooden block) directly behind the indicated box. The infant now has the possibility to choose one box. The test trials will be presented with two puppets (green vs. yellow shirt, played by assistants), whereas one sees the hiding action and the other one does not. Both puppets then give different suggestions about the hide of the object by pointing at and placing a marker (green vs. yellow wooden block) behind the indicated box (counterbalanced). Subsequently, the experimenter put both boxes into the reach of the infant and the question is: whom do they trust?

## PB-032
## The developmental emergence of unconscious fear detection from eyes in infancy

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Eyes play a key role in the rapid and efficient recognition of different emotions. Even when not perceived consciously, fearful eyes are detected by the human brain as shown in adults (Whalen et al., 2004) and in 7-month-old infants (Jessen & Grossmann, in press). However, it is unclear when in development this capacity of the human brain emerges. Specifically, it is not known whether the unconscious detection of fearful eyes follows the same developmental pattern as the conscious discrimination of emotions, where a bias towards processing fearful expressions emerges between 5 and 7 months of age (Peltola et al., 2009). To investigate this question, we examined 5-month-olds' event-related brain responses to subliminally presented emotional eyes and compared their responses to previously published data from 7-month-old infants (Jessen & Grossmann, in press). We presented fearful and happy eyes for 50 milliseconds, which is well below the perceptual threshold for this age group (Gelskov & Kouider, 2010). While 7-month-olds' brain responses differ clearly between happy and fearful eyes at both occipital and frontal electrodes (P1 and Pb/Nc, respectively), we did not find any differences in 5-month-olds, as shown by an interaction with the between-subject

factor Age at all relevant ERP components (P1: F(1,45) = 6.24, p=.016; Pb: F(1,45) = 8.76, p=.005; Nc: F(1,45) = 4.12, p=.048). Our results suggest that the subliminal processing of fearful eyes undergoes crucial development between 5 and 7 months of age, providing further evidence for the emergence of a fear bias around 7 months of age.

## PB-033
## The origins of visual perception of touch

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Touch is the primary way of learning about the surrounding world during prenatal life and infancy (Field, 2001). Already inside the womb fetuses frequently touch their body (Sparling et al., 1999) and these gestures are coordinated and well organized (e.g., Zoia et al., 2007). Given the importance of touch during development, in this study we explored the origins of the ability to visually recognize touching gestures involving others. Looking times and orienting responses were measured in a visual preference task, in which participants were simultaneously presented with two dynamic images depicting a touching and a no-touching gesture, involving different body parts or non-bodily objects. In Experiment 1 3-month-olds, but not 2-day-old newborns, differentiated a moving hand touching a static face (touching gesture) from a moving hand that stopped before touching occurred (no-touching gesture). In Experiment 2 newborns were able to discriminate between touching vs no-touching gestures involving two hands. Conversely, in Experiment 3 newborns did not manifest any preference when a static hand was touched by a spoon. These results demonstrate the importance of somatosensory-motor associations accumulated in the womb to support infants' ability to recognize others' touching gestures through the visual modality.

## PB-034
## Referential gaze and word learning in autism

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When we hear a novel word, we often rely on social cues (e.g. the speaker's direction of gaze) to determine the correct referent of that word (Bloom, 2000). Individuals with autism, on the other hand, are often described to have problems doing so, which can lead to errors in their word learning (Baron-Cohen et al., 1997). However, some researchers observed that not all people with autism exhibit such errors (e.g. Gliga et al., 2012), which led them to assume that the ability to rely on social cues to guide word learning can develop in autism, but it might be delayed compared to typically developing individuals. To test this assumption, we compared the performance of adults with (N=15) and without autism (N=15) on a word learning task, while recording their gaze behavior using an eye tracker. Participants were presented with two unfamiliar objects and a person who looked at one of them (the target) and labeled it with a novel name. Afterwards, participants were asked to choose the target among other unfamiliar objects, which would be only possible by relying on the speaker's direction of gaze. Results showed that both groups mostly chose the correct referent, but less so for the ASD group when the distractor's saliency was increased. Additionally, we have collected data from younger age groups, to allow for developmental comparison, and the results will be discussed in the light of differences in social competencies between the age groups.

## PB-035
## Having and making choices: the impact of free choice on children's prosocial motivation

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Previous research suggests that young children are intrinsically motivated to help others (Warneken & Tomasello, 2008; 2013). This raises the question about factors promoting children's intrinsic motivation to act prosocially. One such factor might be the provision of choice (Deci & Ryan, 2000). Experimental evidence with adults suggests that having choice increases their willingness to help (Horowitz, 1968; Baumeister, Masicampo, & DeWall, 2009).

In the current study, we investigated whether choice already promotes young children's motivation to help. Thus, 5-year-old children were confronted with a situation in which a peer needed help with cleaning up and were then told that they had to help (no choice condition) or that they can help if they want to (free choice condition). While children helped, an experimenter tried to distract children by luring them to an exciting game. Time spent to clean up served as measure for their motivation to help.

Data collection is ongoing. Preliminary data (N= 29) indicates that children provided with choice tend to help longer, compared to children not provided with choice. This suggests that choice already plays an important role in preschooler's motivation to act prosocially.

## PB-036
## Your way or my way? Emulative motor activation during action observation in 14-month-olds

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Much evidence is consistent with the idea that an observer's own motor system plays a role in the prediction of others' actions. On one view, the role of the motor system in action observation is to emulate a way in which a goal will be achieved. We tested this hypothesis by providing two groups of 14-month-old infants with different means (foot action and head action) of achieving the same novel end (illuminating a lamp), after which both groups observed an agent using a different means, which was outside the infants' capabilities (elbow action), to achieve the same outcome. We used the known somatotopic pattern of sensorimotor alpha deynchronization to investigate whether, when infants observed an experimenter interacting with the lamp, they exhibited motor activation that matched in somatotopic distribution, the effector with which they had been trained. After training, infants observed an experimenter turning on the lamp with her elbow and we measured changes in the sensorimotor alpha rhythm of the EEG during a period prior to the onset of an experimenter's action on the lamp. .The analyses focused on electrode sites that correspond with hand (C3, C4), foot (Cz) and head (C5, C6) areas of the sensorimotor cortex. We observed a somatotopic desynchronization of the sensorimotor alpha rhythm related to the effector used by the infant to achieve the goal during training, rather than to the effector used by the actor during testing. Results support the hypothesis that the observer's motor system plays an emulative role in action prediction.

## PB-037
# Infant point following predicts later language development: Evidence from Turkish

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Several studies have shown that socio-cognitive skills such as pointing in combination with vocalization, looking at an object, and gaze following contribute to infants' language development (e.g., Brooks & Meltzoff, 2008; Rowe, 2000; Tomasello, 2003). Less is known about the predictive power of early point following on later language development in languages other than English. In this longitudinal study, we assessed Turkish infants' early point following and its relation to infants' concurrent and later language comprehension and production.In Study 1, 35 children were tested at the ages of 8, 10, and 12 months (20 boys and 15 girls). Children saw an adult experimenter turn to point at one of four animal pictures in an experimental setting adapted from Mundy (2003). Percentages of correct and incorrect looks as well as no looks of infants at any of the pictures were determined. Additionally, each mother completed the Turkish version of Communicative Development Inventory (TIGE in Turkish) (Acarlar et al., 2009). Results indicated that the correct looks at 12 months (and not before) significantly predicted infants' concurrent vocabulary comprehension (β=.542, p=.001) and production (β=.533, p=.001). In Study 2, we followed up 14 of these infants (8 boys and 6 girls) when they were between 33 and 43 months (M=39) by asking their mothers to complete TIGE for language production. Results showed that the correct looks at 10 and 12 months of age significantly predicted infants' language production (β=.617, p=.032 and β=.661, p=.010, respectively). This study demonstrates that early point following is part of the social engagement repertoire of infants that is predictive of infants' concurrent and later language proficiency.

## PB-038
## Young children show the bystander effect

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Much research in social psychology has shown that otherwise helpful people often fail to help when bystanders are present ('bystander effect'; Fischer et al., 2011; Latané & Nida, 1981). Research in developmental psychology has shown that young children are extremely helpful, and that others' presence can actually increase helping (e.g., Engelmann et al., 2012; Staub, 1970). It is thus not clear whether young children's tendency to help can be reduced by the presence of bystanders. In this study, 5-year-old children witnessed an experimenter who needed help. Participants were either by themselves (Alone condition) or in the presence of two peer (confederate) bystanders who did not help (Bystander condition). In a third condition, bystanders were positioned behind a low barrier, visible for the participant and watching the situation, but unable to help (Bystander-unavailable condition). This condition allowed us to investigate the main processes underlying the bystander effect, assuming we observed it (i.e., shyness to act in front of others, social referencing of the bystanders' passivity, or diffusion of responsibility). Indeed, young children showed the bystander effect: Whereas 95% of participants helped in the Alone condition, only 55% helped in the Bystander condition. Results in the Bystander-unavailable condition (helping proportion 95%; N=60; Fischer's exact test, p=.001) suggest that it is diffusion of responsibility, not shyness or social referencing, that underlies this effect. This provides the first experimental evidence for the presence of a bystander effect in young children and suggests that children take responsibility into account when deciding whether to help.

## PB-039
## Prosodic and phonetic information of words differently affect audio-visual perception in infancy

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Preverbal infants can detect specific audio-visual correspondences between geometric shapes and novel words (e.g., rounded-[bouba], or sharped-[kiki]). However, there is little evidence about infants' ability to detect correspondences between object motion

and meaningful words. We examined whether infants' audio-visual perception would change depending on prosodic or phonetic information included in words, and how language skills, such as the size of the vocabulary and word production were related to their attention. In the familiarization phase of this study, 6 to 8-month and 16-month-olds observed the movements of a bouncing ball accompanied by mimetic words. In the test phase, we manipulated three different phonological aspects of mimetic words: (1) Pitch-ascending, (2) Backward-played, and (3) Novel word. We calculated difference scores (DS) by subtracting fixation duration in the familiarization phase from that in the test phase to assess how the sound manipulation affected infants' attention. In backward-played and novel word conditions, 16-months-olds showed negative DS in which the fixation duration decreased in the test phase, whereas younger infants showed neither negative nor positive DS. In the pitch-ascending condition, DS was not significantly different between the two age groups. Furthermore, in backward-played condition, infants who had acquired more vocabulary showed more negative DS regardless of age. In the novel word condition, 16-month-olds who could produce more mimetic words showed more negative DS. These results suggest that infants' audio-visual perception is affected by the phonetic information of words. Furthermore, the influence of phonetic information on their attention is evident around the vocabulary burst, and is related to the size of the vocabulary and production of mimetic words.

## PB-040
## Are pro- or anti-social other-regarding preferences dominant in middle childhood? Evidence from a moonlighting game

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The emergence and development of children's pro- and anti-social other-regarding preferences, and their implications for human cooperation, are vibrant areas of contemporary research. However few, if any, studies to date have attempted to directly compare the strength of the two within the same experiment. The present study aims to rectify this via a version of Abbink et al's (2000) moonlighting game. The moonlighting game involves decisions made sequentially by partners within a dyad. The first player (or "proposer") can choose either a generous or selfish action. The second player (or "responder") then has the choice of whether and how much to reciprocate either type of action with generosity or punishment respectively,

dependent upon the proposer's initial choice. The game thus allows the comparison of pro- and anti-social preferences in baseline and reciprocal circumstances. 300 children aged 5-12 participated in the experiment, 150 as proposer and 150 as responder, between-subjects, over 6 rounds. Proposers significantly preferred selfish to generous acts, and reliably took more than they were willing to give. Responders were more likely to respond punitively to selfish acts than they were to respond generously to generous acts. Such results suggest that in middle childhood children's negative other-regarding preferences are stronger than their positive other-regarding preferences. Implications for human cooperation and relevant comparisons with adult behaviour in comparable experiments are discussed.

## PB-041
## Young infants recognition of rotated objects: fast and slow

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We will present three experiments in 4-month-old infants that test recognition of rotated objects. We use the Rapid Visual Recognition procedure (Langus et al. submitted) where infants are briefly presented with an object and immediately after with two test events (total 64 trials). In Experiment 1 one of the test events contained the familiarization object rotated (0°-180° left and right) and the other test event contained a novel object. In Experiment 2 infants were presented with a mirrored familiarization object and a novel object. In Experiment 3 infants were presented with the familiarization object and mirrored familiarization object. In Experiments 1 and 2 infants showed a novelty preference at 0° that progressively changed to a familiarity preference at 180°. Looking-time measures can capture the relative increase in task complexity caused by the increase in the rotational angle. There were no statistical differences between Experiment 1 and 2, suggesting that infants choose the most likely test object as fast as possible even when it does not match the familiarization object (e.g. when mirrored). In Experiment 3 infants showed a familiarity preference at 0° (as opposed to the novelty preference in Experiments 1) that decreased to chance with the increase of the rotational angle, suggesting that at 4-months infants can recognize an object from a mirrored one if the task demands it. Taken together our results suggest that young infants optimize their strategies for recognizing objects as fast as possible and invest additional cognitive resources for recognition only when absolutely necessary.

## PB-042
## Is the development of afterlife belief linked to children's natural intuitions about mind-body dualism?

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Why is afterlife belief (ALB) common? ALB might arise due to cultural learning or, it may be that people are particularly prone to develop ALB. The early emergence of ALB in children raise the possibility that it has its foundation in children's natural intuitions (in particular mind-body dualism: MBD). Here we investigate the developmental trajectory of ALB and MBD using video-assisted thought experiments.The ALB measure involved a scenario about a mouse that is eaten by an alligator (see Bering & Bjorklund, 2004), with subsequent questions about the continuation of the mouse's biological, psychophysical and perceptual functions, and the continuation of the mouse's emotion, desire, and epistemic thought. The MBD scenario involved the apparent duplication of a person with subsequent questions about the fidelity of the copying in relation to the physical and mental properties of the original.In the preliminary analysis of both the adult dataset and the children collected (N = 58, children 5-9 years-old) afterlife beliefs and mind-body dualism were not correlated. However, both MBD and ALB were stronger in children than in adults. A higher proportion of children (78%) than adults (35%) conceptualized the mind of the person they observed in the duplication scenario differently to the body of that person. In a similar fashion, a higher proportion of children (61%) than adults (28%) attributed continued states of existence to the mouse they were told had died. As with previous work, this pattern was strongest in the cases of emotion, desire, and epistemic thought. Though the data does not provide evidence for a link between the development of MBD and ALB, it does present a pattern not easily reconciled with the cultural learning-explanation. On completion, the presentation will include the full child data set, and age-related difference within the child data will be explored.

## PB-043
## The voice effect in preschoolers – How participation influences children's acceptance of unfavorable outcomes

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Living together with others requires us to constantly arbitrate between our selfish tendencies and adaption to the group. These two aspects interfere if a group decision puts an individual into a disadvantageous position. What makes us stick to the group in such situations? Studies with adults suggest that our tendency to accept unfair offers depends on whether we had the chance to voice our opinion (Ong, Riyanto, & Sheffrin, 2012). We designed a new experimental setup to investigate the development of the 'voice effect' in children. A group consisting of one child and two puppets chose between an equal and an unequal distribution of stickers (disadvantageous for the child) with the puppets always choosing the latter. We manipulated the way the puppets behaved towards the child in four conditions in term of respect and participation: In the 'no voice' condition the puppets just claimed their vote and ignored the child. On level1 they asked for the child's opinion. On level2 they gave justifications for their outvoting of the child and on level3 the puppets furthermore asked the child to agree to their vote. We measured whether the child protested against the puppets.We tested 3- and 5-year-old children. Preliminary results of 96 children (12 per condition) suggest a linear pattern within levels 1 to 3. Protest decreases with increasing participation of the child. However, the 'no voice' condition caused less protest than the 'level1' condition in both age groups. This contradicts the findings of previous research with adults.

## PB-044
## The order of ostensive and referential signals affects dogs' responsiveness when interacting with a human

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Ostensive signals preceding referential cues are crucial in communication-based human knowledge acquisition processes. Since dogs are sensitive to both human ostensive and referential signals, here we investigate whether they also take into account the order of these signals and, in an object-choice task, respond to human pointing more readily when it is preceded by an ostensive cue indicating communicative intent. Adult pet dogs (n = 75) of different breeds were presented with different sequences of a 3-step human action. In the Relevant Sequence (RS) condition subjects were presented with an ostensive attention getter (verbal

addressing and eye contact), followed by referential pointing at one of two identical targets and then a non-ostensive attention getter (clapping of hands). In the Irrelevant Sequence (IS) condition, the order of attention getters was swapped. We found that dogs chose the target indicated by pointing more frequently in the RS as compared to the IS condition. While dogs selected randomly between the target locations in the IS condition, they performed significantly better than chance in the RS condition. This suggests that dogs are sensitive to the order of signal sequences and the exploitation of human referential pointing depends on the behaviour pattern in which the informing cue is embedded.

## PB-045
## Children's selective learning and teaching

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Young children tend to interpret others' teaching as helpful and informative (Bonawitz et al., 2011). Indeed, even infants interpret adults' ostensive referential intentions as an intention to convey generic information (Csibra & Gergely, 2009). Moreover, children are sensitive to gaps in others' knowledge, and learn selectively from more knowledgeable teachers (Baldwin & Moses, 1993). This sensitivity likely is a necessary, but not sufficient, component of teaching (Fry & Ziv, 2005; Kruger & Tomasello, 1996). In the current research, we compared children's use of epistemic information for selective learning and teaching. In Experiment 1, 4-year-old children viewed computer-animated events in which conflicting reports were supplied by two characters, one, knowledgeable, the other, ignorant, concerning the hidden content of a container, and then children were asked to endorse one of the reports. Four-year-old children selectively endorsed the report from the well-informed character.In Experiment 2, children from four age groups (4, 5, 6, and 7 - 8 years) viewed the same events as in Experiment 1, except that the two characters did not report on the box's contents. Instead, children were shown the content of the box and they were asked to select one character to inform about its contents. Only the 7-and 8- year-old children showed some selective teaching of the ignorant character.We found a marked disparity between children's selective learning and teaching. The findings suggest that children's selective learning and teaching may be guided by different cognitive principles, contrary to rational theories of pedagogical learning.

## PB-046
## Whistleblowing in young children: The conflict between loyalty and other moral concerns

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Previous research has shown that already by 5 years children show loyalty to the group. However, little is known about what happens when feelings of loyalty conflict with other moral concerns. This study examines the dilemma between moral and loyalty concerns by looking at 5-year-olds' tattling/whistleblowing to mild versus severe moral transgressions in the ingroup and outgroup context. We predicted that because of their loyalty concerns children would be reluctant to tattle on their ingroup, except when the transgression is severe. The child and four puppets were allocated to two novel groups. Then, the child witnessed how two of these puppets took someone else's valuable objects. Depending on condition, these puppets were either in the same group as the child or a different group, and took either most or just one of the objects. After the puppets left, children had the opportunity to tell a neutral experimenter, who prompted them with up to five questions, about the transgression. Preliminary findings of ongoing data collection (N=24) suggest that, unsurprisingly, children are quicker to tattle about a severe transgression than a mild transgression (mean tattling after 1.27 and 2 prompts, respectively). Against predictions, however, children apparently are quicker to tell on their own group (mean tattling after only .75 prompts) than on the other group (mean tattling after 2.7 prompts). Thus, instead of trying to conceal their own group's transgression, belonging to a group increased children's tendency to blow the whistle. We will conclude by discussing some of the possible reasons for this surprising finding.

## PB-047
## ERP evidence of noun verb distinction

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Recently Bergelson & Swingley (2013) showed that infants have a lexicon very early in their life. In adults, lexicon is organised by the syntactic category of each known word, nouns are encoded closed to the visual area, being object-concept referent, and verbs

are stored next to the motor area, being mostly action-concept referent (Shapiro & Caramazza, 2003). Does infants also make this conceptual distinction: upon learning a word do they distinguish between a more object-concept referent compare to a more action-concept referent?

To investigate this question, we used a Mismatch Negativity paradigm, to reveal abstract distinction in infants (Näätänen et al 2007), with object-referents (nouns) and action-referents (verbs). We selected the 16 most commonly known nouns and verbs across an Italian CDI and presenting them in congruent or incongruent sequences. A sequence presented 4 different words, nouns or verbs, as a context and a target word. This last word can have a Congruous category compare to its context (NNNN N/VVVV V) or an Incongruous (VVVV N/NNNN V). If infants use different brain resources for processing object-referent and action-referent, we should observe different potentials when comparing the Congruous to Incongruent conditions.

For now, the feasibility of this experiment has been tested with adults (n=15). They exhibited a central negativity around 400ms after the onset of the target in the Incongruous condition but not in the Congruent condition. This difference resembling to a MMN was significant ($p<.01$). We are currently running the same experiment with 9-month-old and 16-month-old infants.

## PB-048
## Left-to-right spatial orientation facilitates learning of abstract rules in 7-month-old infants.

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Recent evidence shows that domestic chicks (Rugani et al., 2010) and 7-month-old human infants (de Hevia et al., 2014) manifest asymmetries in spatial processing when they are required to perform an ordinal task. Chicks showed a leftward bias when required to locate a target in a series of identical objects on the basis of its ordinal position. Infants showed a preference for left-to-right oriented increasing numerical sequences over the same sequences presented from right-to-left, suggesting an early predisposition to link numerical order with a left-to-right spatial orientation. The aim

of this study was to investigate whether the spontaneous mapping between order and left-to-right oriented spatial codes is limited to numerical information, or whether it holds for non-numerical ordinal information as well. Using a visual habituation paradigm, we tested 7-month-old infants' ability to extract an abstract rule (ABB or ABA) from a sequence composed by geometric shapes (i.e., rule learning) presented in a left-to-right or right-to-left spatial orientation. In the test phase, infants were presented with both ABB and ABA sequences, maintaining the same spatial orientation as in the habituation phase. Infants looked significantly longer to the novel sequences only in the left-to-right spatial condition, demonstrating that the extraction and the generalization of the rule was possible only when sequences were presented from left to right. This finding provides the first evidence of a facilitating effect of oriented spatial codes on infants' rule learning abilities, suggesting that the mapping between space and number is not unique to number.

## PB-049
## Electrophysiological indicators of word recognition of 9-month-old infants

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It is a long-standing assumption that infant language comprehension precedes language production, however the precise conditions and underlying neural mechanisms are still not well known. Recent studies have hinted that infants might comprehend words before the end of the first year of life, as indicated by an infant variant of the N400 an electrophysiological marker of semantic (in)congruity. However, the results seem to be contingent on the level and nature of exposure to language. For example, Parise and Csibra (2012) found an N400 at 9 months of age only when infants' mothers produced the words, and not when an experimenter, while Junge and colleagues (2012) incorporated familiarization with word and object pairings, hence babies could gain experience with the speaker's voice and the word-to-world mapping. The current EEG experiment set out to further investigate the language capacities of 9-month-old infants in a puppet theater setting. We hypothesized that it might not be the familiarity of the voice that drives comprehension in this age already, but the level of engagement in the situation. Previous studies used video stimuli, while a puppet theater presentation of objects and their naming (congruently or incongruently) might enhance attention, involvement and eventually language comprehension. Preliminary results indicated no N400 effects, but a significant difference at an earlier time window

($p < .03$). This early effect between 200-500 ms has been hypothesized by Friedrich & Friederici (2005) to be a phonological-lexical priming effect. Further investigations are currently under way to refine and clarify initial findings.

## PB-050
## 14-month-olds track others' beliefs about the number and identity of objects

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Infants' understanding of others' beliefs has been documented in a wide range of tasks. Recently it was proposed that infants' ability to attribute mental states is limited to beliefs about object locations, and does not extend to beliefs regarding identity or numerosity (Butterfill & Apperly, 2013). We tested whether 14-month-olds show sensitivity to another person's belief regarding the number of objects in an opaque box. We used a manual search paradigm where infants search longer if they think there is still an object present (Feigenson & Carey, 2003). Infants saw a scene where 1 (in Study 1 and 3) or 2 (in Study 2) objects were put into a box by Experimenter 1 (E1). Then a further object was added (Study 1), or one was taken out (Study 2) or exchanged to another object (Study 3) by Experimenter 2 (E2), while E1 could be present or absent. Finally, E1 took out one object from the box. Thus, in the end, E1's belief about the number of objects either corresponded to the child's knowledge (True Belief), or differed from it (False Belief). We measured how long infants searched for the object. Results show that search times were influenced by the belief of E1 regarding the number of objects [0/1] remaining in the box. This suggests that infants successfully tracked the other person's belief when it involved multiple objects. Moreover, infants took into account not simply the numerosity, but the identity of objects involved.

## PB-051
# Do toddlers have an innate moral core? An investigation into whether toddlers reward a good outcome over a good goal

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Numerous studies have shown that preverbal infants are sensitive to the difference between helping and hindering (e.g., Hamlin & Wynn, 2011). Additionally, 19-months-old toddlers are more likely to give a treat to a puppet helping to open a box; and they are more willing to take away a treat from the puppet that hinders this process (Hamlin et al., 2013).

The methodological challenge is to assess whether infants' and toddlers' preferences are the results of the actor's intention or his action. In other words, do they prefer the helper because his intention is good or because he is enabling a good outcome?

Therefore, the present study provides a paradigm, based on Hamlin and Wynn (2011), in which the helper intends to help but fails to do so, resulting in the same outcome as the hinderer. We also included the original paradigm. In total, 28 participants were recruited for the study. Participants were aged between 9 months and 5 years (62 months). At baseline, the study did not replicate the findings of Hamlin and Wynn (2011). Toddlers did not show a preference for either the helper or the hinderer ($p=0.44$). In our controlled condition, in which helping did not result in a positive outcome, again children did not prefer the helper over the hinderer ($p=0.70$). This study casts doubts about an innate moral core. Alternatively, we hypothesise that what toddlers really prefer is a puppet that imitates the actions of the puppet who needs help.

# POSTER SESSION C

## PC-001
## Toddlers understanding of normativity and competition

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The current study used the game of 'Snakes and Ladders' to explore 3- to 5-year-olds' understanding of competitive advantage. Children participated in two games. In each game they played against two puppets: one of which played according to the rules (up the ladder, down the snake) while the other one played against the rules. In the Up-condition this puppet went up snakes and not down snakes (gaining competitive advantage). In the Down-condition this puppet went down ladders and not up ladders (losing competitive advantage). The children showed greatest explicit protest (i.e., explicit intervention) when the Up-puppet did not move down the snake (40%). Interestingly, moving up the snake resulted in less explicit protest (26.6%). Moreover, only in 20% of the cases did children protest when the Down-puppet did not climb up the ladder. No child explicitly protested when the Down-puppet moved down the ladder. Most children, when explicitly asked, wanted to play with the Down-puppet again, in the down condition (73%) but they wanted to play with the correct playing puppet in the up condition (53.3%). This shows that children preferred the puppet that would give them an advantage. The fact that the children explicitly protested more when the Up-puppet did not go down the snake, versus moving up the snake, suggests that they are demonstrating loss aversion. For Brennen et al (2007) "losses loom larger than gains." That is the children are more aware of and seem to have a heightened response to losses over gains.

## PC-002
## The impact of the first school years on children's phoneme identification and verbal comprehension skills

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Early, diagnostic testing of the skills of children is an essential task, since subsequent development is based on the skills tested. In our country, the DIFER test (Nagy et al. 2004a, 2004b) has proved to be a reliable testing form from early childhood, but early childhood testing is subjective in many cases, depending on the person recording. In our work we are aiming at the (1) development of an online tool to test children's

phoneme identification and verbal comprehension skills, the (2) implementation of objective testing and the (3) examination of crossection of skills development of children with particular attention to the nursery-school transition. In our test (Cronbach's α=0.865) we applied the recognition and location of a sound in a word and the 15 items of the child's Token test (Pléh et. al., 2002). The test was filled by children born between 2005 and 2009 (N=578) in the online system of eDia, using tablets and headsets. Among the children born in 2009, two versions of the test were recorded. The test included parental background questionnaire as well. Our results demonstrated that the children born in 2008 performed significantly differently from all three ages ($p<.05$). There were no significant differences detected between the first and second graders of primary school nor between any of the age groups, however both graders' performance was significantly better than that of the pre-school children ($p<.05$). The specific improvements did not significantly affect the results of the children. Based on the results it can be stated that entering primary school, guided public education and literacy determines the development of phoneme identification and verbal comprehension processes.

## PC-003
## Explaining the moral of the story

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Although storybooks are often used as pedagogical tools for conveying lessons to children, the ability to spontaneously extract underlying themes develops late, and often not until adolescence. It has been proposed that children fail to represent the problem at the optimal level of representation – one that highlights abstract generalizations and understates surface features. Research suggests that the constraints imposed by generating explanations lead children to privilege hypotheses that highlight abstract structure. We therefore hypothesized that generating explanations while listening to a story may promote children's ability to extract the theme.

Five- and 6-year-olds were assigned to either explain or control conditions. The experimenter began by reading an illustrated storybook to children. In the explain condition, children were asked why a key story event occurred. In the describe condition, children were asked what the key story event was. Afterwards, children completed four dependent measures to assess understanding of the theme: 1) reading comprehension (true/false questions about the story), 2) vignette selection (select

a novel vignette that best matches the theme), 3) theme selection (choice between the theme and a surface property), and 4) open response (describe "the most important thing" learned from the story).

Results indicate that explanation facilitates children's ability to override surface features, extract the moral of a story, and generalize it to novel contexts. While explanation did not lead to better recall of story events, children who explained were more likely to select the novel vignette that shared the theme, to select the theme over salient surface information, and to generate the theme in their open responses. These findings not only have important implications for our understanding of the mechanisms underlying narrative comprehension and the impact of explanation on early learning, but they also provide a more complete picture of how children form abstract representations.

## PC-004
## The development of ownership understanding across cultures

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Ownership understanding has been studied predominantly in children from Western populations (Friedman et al., 2008; Kanngiesser et al., 2010; Rossano et al., 2011; Gelman et al., 2012). In a series of studies, we investigated the development of ownership understanding in children growing up in traditional, non-industrialized populations with few personal possessions. In Study 1, we investigated children's use of the first possession heuristic - an ownership rule that Western children already begin to use at two years of age (Friedman et al., 2008). We tested five- to nine-year-old Kikuyu children (N=112) from a small-scale, agricultural group in Kenya. Children watched videotaped interactions of two women passing an object back and forth and were then asked who owned the object. Use of the first possession rule increased with age and five-year-old Kikuyu children used it less often than their German peers. In Study 2, we studied whether five- and six-year-old children would respect each other's possessions in dyadic peer interactions. Kikuyu children from Kenya (N=46) and Wichi children from Argentina (N=36) took part in the study. Pairs of children played with beads on a marble track. The beads were marked in different colors and each child was assigned one color. At the end of the track, all beads dropped into one box and we asked children to retrieve their beads either simultaneously with their partner or in the partner's absence. Children from both populations retrieved their own beads significantly above chance levels and avoided

taking the partner's beads - irrespective of whether the partner was present or not. Children growing up in diverse socio-cultural environments show an early understanding of ownership in peer interactions. But they appear to apply this understanding to third party interactions later than Western children.

## PC-005
## Crossmodal correspondences in 3-4 month-old infants for vision, hearing and touch

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Human adults have shown to systematically match non-redundant sensory features, such as a bright visual stimulus with a high-pitch tone or a small object with a low-pitch tone. Yet, the developmental origins of such crossmodal correspondences are still debated and no study has so far documented crossmodal correspondences other than audio-visual in the infant population. In our study we thus investigated i) whether 3 to 4 month-old infants show crossmodal correspondences for visuo-tactile pairings, and ii) whether, for 3 to 4 month-old infants, crossmodal correspondences for audio-visual pairings extend to illusory visual and auditory stimuli. The visual illusory stimulus consisted of sinusoidal gratings alternating the white and red colours moving behind an elongated rectangular aperture, leading to the impression of a movement along the major axis of the aperture (the so-called "barber-pole illusion"), and the auditory illusory stimulus consisted of several tones gliding continuously in frequency, thus producing the impression of continuously rising or ascending in pitch (the so-called "Shepard-Risset glissando"). Tactile stimuli consisted of a paintbrush that was used to stroke the back of the infant. We found that 3-4 month-old infants showed a preference for congruent vs. incongruent stimuli for both the visuo-tactile and audio-visual pairings. Our results reveal that crossmodal correspondences are present very early in development and shed new light on the general organisation and development of the infant brain.

## PC-006
# The association between maternal BMI during pregnancy and infant auditory attention

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High maternal body mass index (BMI) during pregnancy provides a suboptimal intrauterine environment possibly leading to health and cognitive problems in the offspring. Event-related brain potentials (ERPs) measuring attention in infants may provide a link between this risk factor and the cognitive outcome observed later in life.

Neonates (n=235) and 9 month-olds (n=72), with mothers with mean BMI of 24.82 (SD=4.57) and 24.72 (SD=3.6) at the start of their pregnancy, respectively, were presented with sound sequences in which three types of rare (deviant) events (white noise bursts, environmental sounds, and tones delivered too early within the otherwise isochronous sequence, 10% each) were delivered amongst frequent (standard) tones (1000Hz tones, 70%). ERP-amplitudes and peak latencies were analyzed with repeated measures ANCOVA's controlled for infant birth weight and other potential confounders.

Results obtained revealed that with higher maternal BMI there is: a) a significant increase of the ERP response elicited by a frequently presented tone, suggesting lower habituation to repeated stimuli and b) a decrease of the peak latency of the P3a-like (235-400 ms) response to rare white-noise segments, suggesting higher sensitivity to distraction by wide acoustic deviance. No other effects of maternal BMI were found. The modulation of passive attention may affect later language and skill learning.

## PC-007
## Infants give to larger social sets: Sensitivity to social numbers emerges early in ontogeny.

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Groups are powerful entities, the ability to form them is rare across species. It is clear that adult human psychology is structured in such a way as to enable participation in, and reasoning about, groups. What is less clear is if this capacity for groups has left any marks on the earliest stages of human development. In the present studies we examined the impact of group size on infants' decision-making. In particular, if infants would be more likely to give a resource to a larger, rather than smaller, number of social agents, and take a resource from a smaller, rather than larger, number of social agents. To test this, infants entered a room with two plates. Next to one plate were 11 entities (either objects or social agents), next to the other, only one. Infants were then either asked to take one banana, or to give one banana. Infants overwhelmingly chose to give to the larger social set. This effect disappeared when giving to non-social stimuli, demonstrating that infants were not simply choosing the plate surrounded by more entities. A second control condition yielded the same result. In contrast, there was no evidence of systematic responses in the take conditions: When faced with choosing to take a resource, infants' responses were mixed, with a negligible trend towards taking from the smaller social set, which did not differ from the responses in the non-social control. These results suggest that infants' decisions about conferring benefits (but potentially not yet costs) are sensitive to cues of the relative number of social agents who will be affected, suggesting that certain rudimentary elements of the psychology required to deal with multi-person dynamics may be present even at early stages of development.

## PC-008
## Vietnamese children suppress the influence of the automatic belief-tracking mechanism

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Little is known about cultural differences in children's Theory of Mind (ToM). Whereas non-western cultures seem to be delayed at developing an explicit ToM, no such cultural differences seem to occurr with regard to an implicit ToM (Barrett et al., 2013). An open question is whether children's decision-making is influenced by an automatic tracking of others' beliefs in a non-western culture.

In the current study, 6-year-old Vietnamese children (N=77) were presented with an avoidance self-ToM task (AST; Buttelmann & Buttelmann, submitted), in which participants had to put their pet into one of three boxes while avoiding the box that contained an angry animal. Irrelevant to the task, in the false-belief condition, an agent held a false-belief about the location of the angry animal. Additionally, participants were presented with an explicit version of the task using the same set-up (avoidance other-ToM task, AOT), in which they had to choose a box in which the agent will put her pet.

Whereas children from western cultures differ in their performance in the AST between conditions, participants chose the box that never contained the dog equally often in both conditions, irrespective of the agent's belief. Surprisingly, in the AOT, they also choose this box in both conditions more often than another viable box. It seems plausible that Vietnamese children's high levels of inhibitory control (which were also assessed) enabled them to suppress the influence of the automatic belief-tracking mechanism in the AST. They then attributed this strategy to the agent in the subsequent AOT.

## PC-009
## Interference and priming in spontaneous belief computation

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Humans seem to spontaneously encode other agents' perspective, and these can interfere with participants' behaviour even when irrelevant (Samson et al., 2010). Additionally, Kovács et al. (2010) found that the attributed belief about an object being behind an occluder primed participants' response in a visual detection paradigm resulting in faster detection of the object . We investigated the factors that may be responsible for interference and priming effects. Will an avatar's belief interfere with the participant's belief - resulting in slower object-detection - if the participant and the avatar believe different objects to be behind the occluder? To test this we created stimuli similar to Kovács et al. except that we used two objects. In the movies first Object1 moves behind an occluder with the avatar being present. Then this object is switched for Object2; this switch is witnessed by the avatar, or not depending on the condition (True/False belief). Lastly, the occluder is raised, and one of three outcomes is presented: Object1, Object2 or both objects; and we measured participants' reaction times in detecting the objects. For the one object outcomes participants (N=22) were faster for objects they expected to be present (own-expectation effect (p=.02)). Crucially, they were slower when the avatar had a different belief (belief conflict effect (p=.03)). This suggests that attributed beliefs interfere with participants' own beliefs when being about different objects. Investigating the possible priming and interference relations between attributed and first-level beliefs can give deeper insight into belief attribution mechanisms.

## PC-010
## Infants' expectation of fair distribution of continuous resources. An eye-tracker study with 11 and 15-month-olds

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Background and aims: Infants take into account an agent's previous helping and hindering action (Hamlin et al., 2007) and the outcome of fair or unfair distributive actions to evaluate agents' dispositions (Geraci & Surian, 2011; Sloane et al. 2012). We were interested in verifying the development of the emerging sense of

fairness between the first and the second year of life. We tested 11-month-olds and 15-month-olds by recording their looking behavior during the observation of videos with equal or unequal distribution of continuous resources. We hypothesized that infants would expect a fair distribution of continuous resources by anticipatory looks and notice when the outcome of the distribution was unequal, this showing a preference for the fair agent.

Method: Thirty-two 11-month olds and sixteen 15-month-olds took part in the study. Eye-movements were recorded by a Tobii eye-tracker T120 device. After two familiarization trials, infants were presented with four distribution trials, two trials, where a human fair distributive agent allocated the same amount of milk to two teddy-bears and two trials, where a human unfair distributive agent filled a glass of milk to one teddy-bear, and a little to the other one. Finally, infants were asked to manually choose one of the agents.

Results and Discussions: 15-month-olds' looking times revealed that they expected the continuous resources to be distributed equally: they looked at unequal distribution outcomes (M=5.75; SD=3.28) reliably longer than at the equal distribution outcomes (M=3.93, SD=2.06), t(14)=3.0, p=.024). The younger group did not present this bias. In general, these findings provide evidence that infants in their second year of life are able to evaluate distributive actions and present specific expectations for equitable allocations of continuous resources.

## PC-011
## Metacognitive spacing decisions in 7-year olds, 10-year olds and adults and the effect of repeated study trials

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Metacognition has been defined as "cognition about cognition" and involves monitoring and control processes. The spacing effect is the phenomenon that temporally interrupted studying improves memory performance (Ebbinghaus, 1964). Within a metacognitive context, research suggests that adults but not first graders use their metacognitions (monitoring) to guide their spacing choices (control) (Son, 2004; 2005). The current study investigated metacognitively guided spacing choices in children and adults using a developmentally appropriate paradigm. It furthermore assessed whether metacognitive decision making is affected by experiencing the effects of

previous metacognitive decisions. We tested 7-year olds (N=31) 10-year olds (N=27,) and adults (N=29). Participants were presented with 2 learning blocks of picture pairs (easy, medium, and difficult). They had to make Judgments of Learning (JoL) to predict their future memory performance and had to decide whether to space, mass or terminate their study on an item-by-item basis. Participants experienced a recall phase after the first learning block to gain performance feedback on the outcome of their monitoring and strategy choices before the second learning block. Extending previous findings, our study provides first evidence that already by 7 years of age children can make metacognitively controlled spacing decisions. The analyses revealed age-differences with adults having more clearly differentiated strategies related to their JoL. Furthermore, our study provides evidence that participants adapted their monitoring in a second learning trial, after gaining internal feedback from a previous study phase. Only adults however used the feedback gained after the first study trial to adjust control processes.

## PC-012
## Let's do this together! Social learning in interactions

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Learning from other people by imitation is essential for human culture (Csibra & Gergely, 2006, 2009, 2011). According to the theory of natural pedagogy (Csibra & Gergely, 2006, 2009, 2011), imitation is facilitated by ostensive-referential communication and humans are naturally motivated to teach actions using this type of communication. This paper examines how parents make use of pedagogical communication and when children imitate their parents. In the present study, parents were instructed to play freely together with their child with two toys for 10 minutes. Both toys were novel to the children but parents were previously introduced to the function of one of the toys. Children were 18 months and 4 years old. Qualitative analysis was used to explore parents' use of ostensive-referential communication, parents' highlighting of specific actions or properties of the toys, and children's imitation. I will present examples of how parents used pedagogical communication, when this teaching successfully led to imitation in the child and when the child did not imitate the demonstrated action; I will present examples of when children imitated their parents without prior teaching and discuss what might have motivated this imitation; I will emphasise how the parent-child-interaction further develops directly

following the child's imitation and how this changes the originally taught action. Based on my analyses, I will argue that social learning research in general, and imitation research in particular, would benefit from investigating the interaction in which the learning is happening and how the interaction influences what is learned.

## PC-013
## Do children commit more scale errors after observing a function demonstration by a cultural in-group model?

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The knowledge a person possesses might loose its validity outside the cultural group he lives in. For instance, the functions of artifacts are culture specific, thus the demonstrated function of a novel tool should only be learnt by toddlers if shown by an in-group member. Infants are sensitive to linguistic cues of cultural membership, and have been found to prefer to learn from (imitate) models of their native language at 14 months of age (Buttelmann et al., 2013). Others however, could only detect culture based selectivity in 3 year-olds, not earlier (Howard et al., 2014). We propose that scale error can be used as a measure of selective function learning. Scale error refers to the phenomenon when people make serious attempts to use an object according to its function irrespective of the size of the given exemplar (e.g. try to sit on a chair that is too small/big to sit on). Casler and colleagues (2011) argue that the mechanism behind scale errors is humans' strong expectation that things exist to serve certain purposes, functions (e.g. chairs are "for" sitting). It follows that scale errors only emerge in relation to a novel tool, if the action that is demonstrated on it is interpreted by the observer as the function of the tool. We are currently testing 3-year-olds, an age group that has been shown to be sensitive to the culture-bind nature of functions, and expect them to commit scale errors less frequently following an action demonstration by an out-group member.

## PC-014
## Giving – but not taking – actions afford object feature encoding in absence of outcome selectivity in 12-month-old infants

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Recent studies showed that, upon observing a giving action, infants spontaneously represent it as a social interaction in which one agent has the goal of benefiting the other via resource transfer (Tatone, Hernik, & Csibra, 2013). It has been hypothesized that the function of this representation is detecting reciprocation between exchange partners (Tatone & Csibra, 2013). If so, observing a giving action should also make infants bookkeep the value of the transferred object in order to measure it against later exchanges. We directly tested this prediction across two looking-time studies by investigating whether 12-month-olds infants would encode the identity of an object (a proxy of its value) involved in either giving and or taking actions. Infants were familiarized to a person lifting a solitary object (ball or plush dog) from the middle of a table and putting it either close to herself (taking condition) or close to a motionless agent across the table (giving condition). In the test, infants were presented with one of the familiarization clips and a new clip involving a new object (ball or plush dog). Infants in the giving condition looked reliably longer at the new-object test events, but those in the taking condition did not. Study 2 confirmed that the null results in the taking condition were not due to a failure to encode the action goal. These studies lend further support to the hypothesis that infants infer equality-matching relations behind episodes of active transfer.

## PC-015
## Broad category membership guides visual attention in young children

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By adulthood, our perceptual systems are sensitive to visual shape features that distinguish animate from inanimate entities (animacy) and big objects from small objects (real-world size) (Long et al., under review). How much experience is required

for this sensitivity to develop? We conducted three visual search experiments where children touched a target picture among an array of distractor pictures on an iPad. Stimuli spanned a broad range of familiar basic-level categories and were controlled for average area, aspect ratio, contour variance, contrast, and luminance. Children (M=48.4mo) found animate targets faster among inanimate distractors than among animate distractors, and vice versa ($t(9)=3.08$, $p=.01$). Children (M=46.4mo) also found small object targets faster when distractors were big objects versus small objects, and vice versa ($t(31)=2.52$, $p=.02$). These results suggest that young children are sensitive to the perceptual features correlated with the broad dimensions of animacy and real-world object size. To explore whether similar results exist for any salient conceptual distinction, we asked if edibility (i.e., edible vs. non-edible objects) would influence visual search speeds, and found no differences in a group of 3- and 4-year-olds ($t(14)=-1.35$, $p=.20$) or when including 5- to 6-year-olds ($t(26)=.02$, $p=.98$). Though children can identify the animacy, real-world size, and edibility of individual entities by two years of age, only animacy and real-world object size influenced children's visual search speeds. Our visual system may quickly generalize across basic level categories for these core dimensions, constructing perceptual feature representations for animacy and object size that guide visual attention.

## PC-016
## The role of intentionality and norm violation in children's causal attribution

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For adults, it has been shown that the relationship between causal judgments and normative evaluations is intertwined in many respects. For example, when people are presented with queries about the causes of a specific outcome, they are influenced by the normative status of the behavior causing the outcome (Hitchcock & Knobe, 2009). The reasons for this influence are controversially discussed in the literature with one prominent account claiming that the effect can be explained by a blame attribution of the norm-violating agent (Alicke, Rose, & Bloom, 2011).The present studies investigate the ontogenetic perspective of this phenomenon. In Study 1 we presented 48 five-year-olds with a video where two causal agents equally contributed to an outcome. The normative status of the behavior of one of the agents was varied across conditions. When asked who caused the problem, children tended to choose the norm-violating agent over the norm-conforming (binomial test, 15 out of 24, $p=.013$). No preference for

either agent was observed when no norm was violated (binomial test for "both", 13 out of 24, p=.026).In Study 2 we take a closer look at the cognitive foundation of the effect, i.e. can a blame attribution explain the results of Study 1? Here we introduce children with a norm-violating agent who is ignorant of the norm and thus unintentionally violates it. We investigate whether children still choose this agent as the cause of the problem, though she should not be blamed for her behavior. Data collection for Study 2 is ongoing.

## PC-017
## Pointing behavior in infants reflects the communication partner's attentional and knowledge states: A possible case of spontaneous informing

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Inferring the epistemic states of others is considered to be an essential requirement for humans to communicate; however, the developmental trajectory of this ability is unclear. The aim of the current study was to determine developmental trends in this ability by using pointing behavior as a dependent measure. Infants aged 13 to 18 months (n=32, 16 females) participated in the study. The experiment consisted of two phases. In the Shared Experience Phase, both the participant and the experimenter experienced (played with) an object, and the participant experienced a second object while the experimenter was absent. In the Pointing Phase, the participant was seated on his/her mother's lap, facing the experimenter, and the same two objects from the Shared Experience Phase were presented side-by-side behind the experimenter. The participants' spontaneous pointing was analyzed from video footage. While the analysis of the Shared Experience Phase suggested that there was no significant difference in the duration of the participants' visual attention to the two objects, the participants pointed more frequently to the object that could be considered "new" for the experimenter (in Experiment 1). This selective pointing was not observed when the experimenter could be considered unfamiliar with both of the objects (in Experiment 2). These findings suggest that infants in this age group spontaneously point, presumably to inform about an object, reflecting the partner's attentional and knowledge states.

## PC-018
## The false belief task reconsidered

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Children under four fail in the false belief task (FBT). This has been taken to show that they lack adequate understanding of the concept of belief. However, a series of recent experiments have shown that children who fail in the FBT still have the correct expectations. This is known as the Developmental Paradox. We suggest a new explanation, which we tested experimentally.Our hypothesis was that the children who fail the FBT misunderstand what they are asked and think they are asked not what the agent will do but what it should do.First, adults often ask a young child something to which they obviously know the answer when trying to teach him what should be done and expecting him to answer accordingly.Secondly, when we face a child with several optional actions and check whether he knows what he should do, we often ask him, 'What will you do?'. He is often exposed to choice questions in the future tense having not a descriptive but a normative meaning.We devised an experiment that establishes the misunderstanding of the question. In it,1. passing the simple task doesn't require ascribing a false belief2. if the child answered saying what the agent should do, he would failWe also conducted a version of the FBT, to see whether failures in the two tasks are correlated. We got significant correlation.Accordingly, the factors operative in the new task (NT) are also operative in the FBT. If our hypothesis is right and children fail the NT because they think they are asked what the agent should do, then this also explains their failure in the FBT and resolves the Developmental Paradox. Failure in the FBT is not due to the child's alleged inability to ascribe false beliefs.

## PC-019
## Solving the disjunctive syllogism in infancy?

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Logical abilities are central to human mental life because of their role in reasoning and in the semantic structure of language. In this work, we begin to investigate the origins of logic in infancy, asking whether young preverbal infants can solve the disjunctive syllogism: A or B, not A; therefore B. In a visual search paradigm, we present 10-month-old infants with a

series of short videos. In familiarization trials, each video presents two cards, initially face down. Each card flips to reveal either a smiley face or a basketball. The smiley face then flashes while a rewarding sound is played. We thus teach infants that either the left card or the right card has a smiley face on it (smiley face is on card A or card B). In test trials, one card only flips, revealing its picture, and then flips back; the second card remains unknown. In memory test trials, the revealed card displays the smiley face. In inference test trials, the revealed card displays the basketball. With an eye-tracker, we measure which card infants look when the rewarding sound is now played, although both cards are face down. We find that 10-month-olds look longer at the revealed card in memory trials, but looked longer at the unknown card in inference trials. These results suggest that infants are able to solve the disjunctive syllogism, inferring that the smiley face is on the unknown card: the smiley face on card A or card B, it is not on card A; therefore it is on card B. However, an alternative interpretation remains possible, which does not require a logical inference: the smiley face in on card A or card B, it is not on card A; search somewhere else. Follow-up experiments will try to disentangle between these two interpretations.

## PC-020
## Exaggeration of fine-grained actions and eye gaze in infant-directed action

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Many studies have suggested that mothers exaggerate their action when instructing infants. However, it is not well understood whether fine-grained manipulations (e.g., grasping, carrying, and placing the objects) are also exaggerated. Visual feedback is required to produce such fine-grained actions. The aim of this study was to examine whether visually guided action could be exaggerated during infant-directed action. We asked 10 mothers to demonstrate to their own infants (infant-directed action) and two adults (adult-directed actions). The demonstration consisted of three actions (i.e., grasping, carrying, and placing the objects). As a result, we found that mother's grasping and carrying actions were more exaggerated in infant than adults, whereas placing action was not. In the demonstration, the mother's looking time to observers varied depending on the observers. The looking time was longer to infant than adults. The detailed analysis of mother's gazes revealed that mother's gazes were directed to observers at the onset of movement during infant-directed action. These results suggest a possibility that mother's monitoring infant's attention caused the exaggeration of the fine-grained actions.

## PC-021
# Dissociation of cognitive and affective empathy measured by ToM and facial mimicry: Their relations to social behaviors in Korean children

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There are many definitions of empathy but it is generally seen as having at least two aspects: (1) knowing another person's internal states such as thinking and feeling; (2) feeling and sharing what another person is feeling. The first aspect is called as "cognitive empathy", and the second as "affective empathy". This study examined the relation of cognitive and affective empathy to social behaviors. Fifty-three 10- to 12-year-old Korean children participated. Cognitive empathy was measured by batteries of theory of mind (ToM) tests; false belief, apparent emotion, second-order false belief, irony, faux pas test, and the Faces tests in which children had to select the photograph matching with the target emotion word from the 4 different photographs expressing different emotions. Affective empathy was measured by facial mimicry response, based on the assumption that emotional contagion by facial mimicry is a key factor in affective empathy (Barsh, 1983). Facial mimicry were measured with the facial electromyography activity in the zygomaticus major and corrugator supercilii muscle during exposure to dynamic happy and sad expressions. Cognitive and affective aspects of empathy were also assessed by self-report questionnaires such as IRI (Davis, 1983), BEI (Bryant, 1982) and EQ-C (Auyeung, et al., 2009). In addition, children's prosocial and aggressive behaviors were evaluated by self-report questionnaires. ToM scores were not correlated with the cognitive empathy subscale scores of three empathy scales. In contrast, the facial mimicry scores which were the differences in mean muscle activity at the zygomaticus major between exposure to happy and sad expressions were correlated positively with the affective empathy subscale scores. Both the Facial mimicry and ToM scores did not predict the children's aggression but predicted different aspects of prosocial behaviors. The present results demonstrated the dissociation of cognitive and affective empathy.

## PC-022
## A word extension task reveals reciprocity expectation for giving actions in 14-month-old infants

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Given recent evidence suggesting that infants may spontaneously interpret giving actions as providing material benefits to their recipients (Geraci & Surian, 2011; Tatone & Csibra, 2013), we aimed at testing whether the observation of giving would also elicit reciprocity expectations. In a word-extension task, 14-month-old infants were trained to associate a novel word with agents that had different appearance but performed the same action role (Giver). During test, infants were asked which agent the trained word could be extended to after having watched a complete giving action. If giving affords the expectation that benefits should be returned, infants should map the trained word onto the Givee, which would be the expected (reciprocating) Giver, rather than onto the current Giver. This prediction was supported by our findings in Experiment 1: infants looked significantly longer at the current recipient than current Giver upon hearing the trained word compared to a new one. Infants' preference in Experiment 1 cannot be explained by linking the word with the resource given, as they did not show any preference during testing either the trained word or a new word when the recipient was labelled in Experiment 2. Experiment 3 confirmed that the results of Experiment 1 were not due to general expectations of turn taking but specific to the interaction observed. Taken together, these studies show that 14-month-olds spontaneously anticipate reciprocation in the context of resource transfer.

## PC-023
## Communication about absent entities in 12-month-old infants and great apes

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Communication about absent and displaced entities is a fundamental property of human language. Recent studies explored the evolutionary and developmental origins of this ability in non-linguistic beings such as 12-month-old infants and nonhuman great apes (Liszkowski et al., 2009; Lyn et al., 2013). However, these studies yielded contradicting results for apes and, more importantly, did not test the role of shared experience in requesting absent

entities in apes or infants.Our ongoing study comprises a series of experiments to test the ability of 12-month-old infants and great apes (Bonobos, Chimpanzees, Gorillas and Orangutans) to request absent entities. We focus on the question whether subjects are specific in their requests and whether subjects make them based on shared experience. Therefore, we adopted the pointing paradigm used by earlier studies with an improved methodology.Our preliminary results show that apes (N=36) request, however infrequently, specific absent entities. Furthermore, apes do not request absent entities from a novel experimenter who is unfamiliar with the situation. Ongoing data collection will help to specify the cognitive and motivational factors underlying this behavior in apes. Furthermore, using a comparable setup, preliminary results for 12-month-old infants (N=40) show that they also request absent entities. Ongoing data collection will address the questions whether infants are specific in their requests and whether they base them on shared experience. In the end, we hope to specify the evolutionary and developmental origins of the cognitive and motivational mechanisms that enable communication about absent entities.

## PC-024
## Emotional and cognitive executive functions and everyday behavior of preschoolers

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Executive function (EF) refers to the top-down neurocognitive processes for realizing goal-directed behaviors, and it is known to have two major characteristics: cognitive and emotional. Cognitive EF (Cool EF) depends on dorsolateral prefrontal cortex and plays a role in cognitively demanding situations, whereas emotional EF (Hot EF) depends on orbitofrontal cortex and plays a role in emotional and motivational contexts. Different developmental studies have investigated contributions of cognitive and emotional EF to a variety of cognitive activities, however, the relationship between these and everyday behavior remains unclear. Therefore, the relationship between cognitive and emotional EF and everyday behaviors of preschoolers was investigated. Preschoolers (N=46) completed four EF tasks: Red/Blue Stroop task (putative cognitive EF), Simon task (putative cognitive EF), Gift Delay task (putative emotional EF), and Children's Gambling task (putative emotional EF). Kindergarten teachers completed the Strengths and Difficulties Questionnaire (SDQ) to evaluate children's everyday behaviors. Exploratory factor analysis indicated that Stroop, Simon, and Gift tasks were categorized as cognitive EF factors, whereas Gambling task was

regarded as an emotional EF factor. Correlation analyses indicated that after controlling for age and vocabulary, children with the worst performance in cognitive EF tasks had higher scores on the hyperactivity/inattention subscale of the SDQ, whereas Gambling task performance was positively correlated with prosocial behavior subscale of the SDQ. These results suggest that cognitive and emotional EF affected different aspects of preschooler's everyday behaviors. The importance of emotional EF mediated by the orbitofrontal cortex in the development of prosocial behavior is discussed.

## PC-025
## Understanding negative numbers in elementary school

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In the present work we assume that the understanding of the numbers derives from the system in which they are anchored. First, we suppose that originally children get the meanings of number words based on their knowledge about the objects, and matching sets. Accordingly, children are able to perform numerical operations that also can be performed on the objects. Second, we assume that numbers could be anchored to other semantic systems, expanding the set of meaningful operations, because the rules of the anchored system can be transferred to the numbers.

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

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

## PC-026
## Facial expression of emotion, not gaze direction, determines social orienting at 9 months of age

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We investigated the interactions between the effects of gaze direction and facial expression of emotion on social orienting in infants. We used a gaze-cueing task with 3 emotions: happy, angry and fearful to measure the speed of orienting to a peripheral target either congruent vs. incongruent with gaze direction. In Experiment 1, cross-sectional, the final sample consisted of 19 infants, aged 8.5-11.5 months. In Experiment 2, longitudinal, the final sample consisted of 24 infants, aged 9.0-9.7 months. Infants were presented with faces which first looked straight ahead and then shifted gaze either to the right or left. Finally, a target object appeared in the gaze-cued or in the uncued location, with 50% chance. Participants saw 24 trials. Saccadic reaction times (SRTs) were measured with an eye-tracker. The effects of emotion expression and gaze direction on SRTs were tested in a 3x2 ANOVA. In Experiment 1 no significant main effect of emotion was found ($F<1.64, p>.2$), while the main effect of gaze direction showed a non-significant trend ($F(1,18)=4; p=.06$). A significant interaction of both factors ($F(2,36)=6.46; p=.00$) indicated that the effect of emotion on SRTs depended on gaze direction. In Experiment 2 we didn't find a significant main effect of gaze direction or an interaction between gaze direction and emotion ($Fs<.9$, $ps>.35$). We found a significant main effect of emotion ($F(2,44)=4.79$; $p=.01$). Our results suggest a developmental transition in the interactions between gaze direction and emotion processing between 9 and 12 months of age.

## PC-027
## Young children's aversion to inequality

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Inequality aversion is defined as the tendency to dislike and correct unequal outcomes among individuals. As such, inequality aversion is closely tied to social comparison processes. Though children dislike receiving less than possible in non-social contexts, their disapproval is greater when they receive less than others in social contexts (McAuliffe, 2014). Recent research suggests that 4- to 5-year-old children are averse to inequalities (Shaw, 2012; Blake, 2011). However, negative reactions to advantageous inequalities - in which the child gets more than others - have not been documented before 8 years of age.

We tested 3- and 4-year-old children's reaction towards different distributive offers. Children could retrieve or reject smarties by turning a crank in the respective direction. Four different offers were made in counterbalanced order, (5,5), (1,1), (5,1), and (1,5), such that the offer was either equal or unequal, and either high or low. The smarties were either allocated to the child and a collaborative puppet partner (social condition) or nobody in which case they ended in the trash (non-social condition). We coded whether children showed any aversive reactions like rejections, or attempting to equalize by sharing or requesting.

Preliminary data (N=45) reveals that children of both age-groups show high rates of aversion for both (1,5) and (5,1) offers, but not for equal offers; and only in the social condition. In the non-social control condition children rarely reacted aversively. These results suggest even 3-year-old children show forms of advantageous inequality aversion if the situation provides a strong social context.

## PC-028

## A mnemonic advantage of value: the relevance of a movement sequence as a factor in procedural memory consolidation in children

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Although memory consolidation processes, generating long-term memory for skills ("how to" knowledge), are faster, perhaps less biased, in children compared to adults, these processes, in both adults and children, are susceptible to interference by subsequent competing experiences. Here, using the finger-to-thumb opposition sequence (FOS) learning task, we show that, in 12 year-olds, the affordance of a context in which task relevance is increased can lead to more robust, and biased, consolidation-phase related (delayed, "offline") performance gains. All of the children were given an identical training experience on a 5-element FOS. Children who practiced the sequence of movements in the more meaningful context – they were told that the performance of the FOS was a secret key to obtaining an entry code to a website with games - showed a small advantage in performance speed and accuracy within the training session, but in addition were able to express larger delayed gains, at 24 hours post training, compared to children practicing

the sequence of movements in a neutral context. Moreover, practicing the sequence of movements in the more meaningful context resulted in significantly reduced susceptibility of the trained movement sequence to interference by a subsequent learning experience; robust delayed gains were expressed despite interference, in the more meaningful context. We propose that task relevance, reward expectation, may constitute a factor which gates the generation of procedural memory in pre-adolescents, biasing the selection of what is to be maintained in long-term "how to" memory.

## PC-029
## The mechanisms of adjective acquisition in L1

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The report deals with the early stages of adjective acquisition (L1) focusing on the role of language input (CDS) in this process. More specifically, both the linguistic (the 'quantity' and 'quality' of adjective input [Snow 2014]) and the extra-linguistic (cognitive features of adjectives intuitively selected by caregivers while communicating with young children) characteristics of CDS are discussed, based on analysis of the largest modern Russian longitudinal corpus (CHILDES [MacWhinney 2000]).Initial adjective repertoires (CDS vs. CS) are compared from the aspect of their semantic and grammar dominants. The main communicative strategies of caregivers – i.e., the semantic (varieties of qualitativeness), structural (types of reformulation), pragmatic (metadiscoursive vs. conversational), and formal (particularly, 'open' vs. 'closed' interrogatives) characteristics of the elicitations and reactions which they employ in a conversation to stimulate the early acquisition of adjectives are considered [Dressler et al. 2006; Kazakovskaya 2010, 2011].The results obtained provide new data for the understanding of the formation of mental representations associated with the acquisition of sensory patterns by children, as well as leading to the conclusion that the role of language input in adjective acquisition is significant: the frequency of semantic and grammatical dominants in CDS and CS correlates well. It is assumed that the main mechanisms of adjective acquisition in L1 lie in a) the cognitive properties of adjectives, especially those relating to sensations received through the senses [Sechenov 1943], and b) the conversational strategies of caregivers, including fine-tuning phenomena. Two strategies of adjective acquisition by children connected with their perceptual and cognitive experience are discussed.The research was carried out with the financial support of the Russian National Foundation (grant 14-18-03668 "Mechanisms for the Acquisition of Russian and the Development of Communicative Competence at the Early Stages of Child Language").

## PC-030

# Infants reduce their movements when their partner sings

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It is commonly assumed in developmental research that infants are early stakeholders during the interactions established with their caregivers (e.g., Golberg, 1977). Tools that are available to the infant so as to interact with others vary from visual contact to smiling or vocalizing, but also involve motor activity. Surprisingly, very few studies have explored so far how young infant's motor activity is enacted according to the nature and context of social interactions. The present research investigated the kinematic properties of the movements of the foot and the face of 11 infants aged between 5 and 9 months during contrasted interactive episodes (i.e., in the passive presence of, or engaged in interaction with, either the mother or a stranger singing a nursery rhyme). A camera was positioned at a standardized distance from the infants' left side and recorded the entire experiment. Body landmarks were chosen and their displacements in the sagittal plane were calculated offline with specific software. The results indicate that motor activity measured in these two parts of infants' body significantly decreased during interactive episodes as compared to episodes without interaction, both in the "mother" and the "stranger" conditions. These preliminary results are in line with those reported by Thelen (1981) and more recently by Nakata and Trehub (2004) and confirm the relevance of the analysis of motor activity to delineate the early forms of interactive episodes in infants.

## PC-031
## When they pass standard false belief tasks, children also master identity related numerical tasks

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Theoretical Background: It is commonly assumed that children acquire a full blown meta-representational conception of beliefs and other propositional attitudes around age 4 when they begin to master standard false belief (FB) and related tasks. However, a different line of research has shown that children of this age still fail to understand the essential aspectuality of beliefs and other propositional attitudes, the fact that they refer to objects only under specific aspects (e.g. Apperly & Robinson, 1998, 2003). The empirical situation is thus somewhat paradoxical. In order to solve this tension we investigated the performance of 4-year old in a numerical task requiring an understanding of the intensionality of identity. Method: The study (ongoing) investigates this by showing children a protagonist who does not know that two qualitatively identical objects she saw enter a box at two different time points were numerically identical and thus falsely believes there are two objects in the box (Figure 1). In order to answer correctly, the child has to understand the aspectuality of the protagonist's belief. Their performance compared to their performance in the standard false belief task. Results: Data collection is still ongoing, but preliminary findings show that children, who master the standard false belief task, also succeed in this new task. This suggest that previous aspectuality tasks might have seriously underestimated young children's competence due to specific task demands and performance factors.

## PC-032
## Choosing between conflicting claims in a hiding game - early forms of selective trust

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Recent research on selective trust has shown that children aged 3-4 robustly prefer reliable over unreliable models (e.g. acquiring new words from previously knowledgeable over previously ignorant informants) – whereas younger children typically fail such tasks or show inconclusive results. Does this capacity develop around that age or is it present already earlier but has been masked in previous studies by performance factors such as high (verbal) task demands? Some studies using only one informant at a time suggest that children from age two show some capacity to track the reliability of single informants.

But these studies leave open whether young children can choose the preferable source of information when confronted with conflicting sources. The purpose of the current study, therefore, is to establish a new method with reduced task demands that enables us to address that question with two-year-old children. We use a computerized touchscreen version of a hiding game: an object repeatedly hides in one of two locations and two informants give differentially reliable hints to the object's location. The dependent measure is whether children follow the hints of the reliable rather than the unreliable model in their own search in eight subsequent test trials. Preliminary results with mostly 3-year-olds (N=20, m=42 months) show that children did prefer to follow the reliable model's hints (t(19)=2.85, p=.01). Ongoing data collection with younger children will tell whether this pattern holds for 2-year-olds. The present findings thus suggest that basic selective trust is present already in 3-year-olds and perhaps even in 2-year-olds.

## PC-033
## Young children's learning to enforce social norms

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Recent research has established that young children from around 2-3 years of age actively enforce the norms of conventional rule games on others, i.e., these young children will intervene and protest when they witness someone playing a game in the wrong way (e.g., Rakoczy, Warneken, & Tomasello, 2008; Schmidt & Tomasello, 2012). However, it remains unknown through which interactions children acquire the actual behavior of enforcing a norm on others. Do they mainly learn to enforce norms after norms have been directly enforced on them or are they equally attuned to interactions of third parties in which norms are enforced on someone else?In the present study, we examine 3-year-old children's tendencies to enforce and generalize a game rule depending on whether they have experienced this rule being enforced on them directly by the experimenter (2nd personal condition) compared to them having seen the experimenter enforce the rule on someone else (3rd party condition). In a control condition, children observe how the experimenter performs the "wrong" and the "right" actions while marking them as idiosyncratic preferences instead of normative rules (between-subjects). Children then witness a puppet performing the "wrong" and the "right" game actions and their spontaneous protest is measured. We hypothesize that children will learn to enforce norms in both cases. However, their tendency to protest might be even stronger after they have been the addressees of enforcement themselves. Data collection is in progress and results will be presented on the poster.

## PC-034

# On the edge of language acquisition: inherent constraints on encoding multisyllabic sequences in the neonate brain

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Language is a defining feature of our species and is learned rapidly during the first years. Yet, the mechanisms underlying this rapid acquisition remain an open question. Language learning requires organizing sequences of syllables into different hierarchical levels of words, phrases, and sentences, with these levels typically marked by prosodic boundaries. Infants must encode these hierarchal structures and track the positions of linguistic units at each level. Here we investigate whether human neonates are equipped to encode the positional information of syllables in multisyllabic sequences. Research shows that sequence edges are better encoded than internal components – they are remembered better and their positions are more precisely encoded – though it is unknown whether this is an inherent constraint that is evident at birth. We used Near-Infrared Spectroscopy to investigate how the newborn brain tracks position in multisyllabic sequences. After familiarization to a six-syllabic sequence, neonates detected the change (as evidenced by an increased in oxy-hemoglobin) when the two edge syllables switched positions but not when two middle syllables switched (Experiment 1). Moreover, when a 25ms pause was inserted between the middle syllables as a hierarchical prosodic boundary, neonates detected the change (Experiment 2). These results suggest that 1) the edge bias is an inherent sequential processing constraint of our species, and 2) that prosodic cues segment otherwise continuous sequences, with these constraints operating across each subcomponent. This hierarchical encoding is a fundamental signature of our communication system and humans are born equipped with the mechanisms to track this information from language.

## PC-035
## Discrimination of dynamic facial expressions in newborns

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The ability to discriminate between different facial expressions is fundamental to understand the internal states of others and, thus, it plays a key role in social interactions. Recent evidence has shown that this ability develops very early in human life. In fact, at birth newborns appear to be able to differentiate between static faces depicting fearful and happy expressions (Farroni et al., 2007). To date no study has investigated newborns' ability to discriminate dynamic facial expressions. Several studies indicate that the emotional processing of facial expressions is facilitated when adults witness dynamic stimuli rather than static (e.g., Sato et al., 2004). The aim of this study is to investigate whether 2-days-old newborns are able to discriminate between a happy and a disgusted dynamic facial expression using a visual preference (Experiment 1) and a habituation task (Experiment 2). In Experiment 1 newborns didn't show any preference when presented simultaneously with happy and disgusted expressions. In Experiment 2 newborns were habituated with one of the two expressions and then tested with a preference test in which both facial expressions were simultaneously displayed. Results have shown that during the test phase newborns looked longer to the novel than to the familiar stimulus, demonstrating to discriminate between the two expressions. These results, though the collection of data is still in progress, demonstrate that from the first stages of postnatal life newborns are sensitive to the emotional content conveyed by dynamic facial expressions.

## PC-036
## 3-year-olds understanding of incompatible desires and competitive games

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Two prominent approaches explain the emergence of children's understanding of beliefs and desires: the symmetry approach, which holds that an understanding of beliefs and desires emerges in parallel (Perner and Roessler, 2012), and the asymmetry approach, proposing that an understanding of desires precedes an understanding of beliefs. Tasks in two areas have been proposed to test for children's understanding of the subjectivity of desires: Incompatible desires and competitive games. Empirical

evidence from either approach is mixed. A number of studies show that children can understand and correctly ascribe incompatible desires to two agents before they pass a standard False Belief Test (Rakoczy et al 2007, Rakoczy 2010). However, children seem to be unable to account for another's desire, or predict an agent's action in the context of competitive games before they pass FB tasks (Priewasser, Roessler, and Perner 2012). These mixed findings leave open at least two possibilities: Both kinds of tasks are an equally valid measure of an understanding of desires, and diverging results are due to differing task demands and task designs. Alternatively, it is possible that both tasks measure different capacities and that the performance aspect of competitive tasks (hindering someone else while favouring oneself) goes beyond a mere understanding of subjective desires. In order to explore this question, we designed a structurally analogous task that measured the understanding of incompatible desires and competition. Data collection is ongoing. Preliminary results are consistent with the asymmetry view, and suggest that both types of tasks measure an understanding of incompatible desires, but competition tasks pose additional cognitive and motivational demands.

## PC-037
## After the point: Developmental changes in allocation of attention to locations, objects, and novelty

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It has remained contentious what infants encode when they follow others' points, and how infants allocate attention afterwards. Research suggests that infants are biased to expect and attend to objects following others' points or gazes (Csibra & Volein, 2008; Yoon et al., 2008), although infants also encode the locations to which their attention is directed (Samuelson et al., 2012; Saylor, 2004). Research also suggests that when a cue has ceased, infants' attention orients to novel (previously un-cued) stimuli (Reid & Striano, 2005); however pedagogy and cultural learning theories would predict selective attention to previously cued objects (see also Okamoto-Barth et al., 2011). The current study tested infants' encoding of locations versus objects, and novelty versus social learning responses. We tracked 10- and 14-month-olds' eye movements as they watched an actor point to one of two objects. At test the actor disappeared and either the objects remained, disappeared, or were swapped. 10-month-olds attended in all cases longer to the

un-cued side – their allocation of attention followed a novelty response, and was mainly based on location information. 14-month-olds attended longer to the cued side when the objects remained or disappeared –their allocation of attention was driven by the social cue, not novelty. When objects were swapped, 14-month-olds attended longer to the un-cued side containing the previously cued object, demonstrating a preference for object versus location encoding. Findings reveal developmental changes from location to object processing; and from novelty responses to social learning between 10 to 14 months, perhaps relating to infants' concurrent increase in sustained social interactions.

## PC-038
## Pupillometry reveals communication-induced object representations in infants

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Behavioral and looking time studies suggest that infants understand the referential nature of eye gazes and deictic gestures towards the end of their first year (e.g. Moll & Tomasello, 2004; Behne, Liszkowski, Carpenter & Tomasello, 2012; Csibra & Volein, 2008). However, these studies have not unequivocally established that infants expect a referent object before seeing it, and remain amenable to simpler attention-following accounts.We measured pupil dilation, which assesses differences in cognitive processing more directly than quantitative measures like looking time. Increase in pupil size has been reported as an accurate physiological measure of violations of expectations in infants (Jackson & Sirois, 2009; Gredebäck & Melinder, 2010). In the current study, 12-months-olds (N=18) watched videos of a protagonist who either pointed towards an occluder in front of her (pointing condition), or remained still (neutral condition). At test, the occluder opened to reveal one of two outcomes: a blank table or a toy. Results showed that infants' pupils were significantly smaller when the pointing was followed by the expected outcome of a toy than in all other conditions. Thus, infants demonstrated the least amount of surprise when the pointing referred to an object, compared to when the outcome of the video was a blank table, or when it was not preceded by a cue and hence unpredictable. These differences were not apparent in looking times, excluding biases due to the amount of allocated attention. The study demonstrates that preverbal infants understand pointing gestures as referential, even when the referents are not perceivable.

## PC-039
## Spatiotemporal regularity and infants' visual predictions: an ERP study

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Recent evidence demonstrates that young infants are sensitive to the probabilistic structure of their visual environment and make use of statistical regularities when deploying attention (Kidd, et al., 2012; Tummeltshammer & Kirkham, 2013). Infants differentiate among visual events of varying likelihoods, looking longer and deploying attention more rapidly to predictable, rather than unpredictable, events. Studies using event-related potentials (ERPs) suggest differences in cortical signals associated with predictive and reactive saccades (Csibra, et al., 2001). However, to date there are no studies reporting on the neural bases of probabilistic visual predictions in infants. We adapted the visual expectancy paradigm used in Csibra, et al. (2001), to present 8-month-olds (n=20, 2 more excluded) with a 2x2 grid of four possible animations that appeared one at a time with the following probabilities: 100%, 75%, 50%, or 50%. Horizontal eye movements to the predictable visual events were coded using video and EOG. Although the paradigm did not generate a reliable number of anticipatory saccades, we did find differences in saccadic latencies: 13 out of 20 infants had faster saccades to predictable events compared to unpredictable events (Mpred=164 ms, Munpred=201ms, t(12)=3.33, p=0.007). Further, among all infants, we found differences in total visual attention: Consistent with Kidd, et al. (2012), infants looked away from the screen more often on unpredictable (50%) trials and tended to sustain attention to predictable (100% and 75%) trials, t(19)=2.81, p=0.01. Scalp EEG was recorded during viewing, and both stimulus- and saccade-locked ERP results will be discussed.

## PC-040
## Learning to read affect on mirror invariance

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In nature left-right discrimination is irrelevant, because natural objects are mostly symmetric. This tendency is called mirror invariance, which was helpfully, because it made the recognition faster in the ancestral word. However learning reading to make difference like 'b' from 'd', one has to break this invariance. This means, that literacy

breaks mirror invariance in adults, comparing to illiterate (Pegado et al., 2013). In our study, we examined mirror invariance in children; before they started to learn to read, and another group who had one year reading experience. We used fast same-different visual paradigm with letter strings, false fronts, graspable and non-graspable objects and asymmetric bodies. Each categories consisted 30 pairs; same, mirror and different presentation. According to the results, there was interaction between groups and categories. The presentation type also impacts the performance of the groups. Illiterates performed better in mirror images in all cases, while literates performed better in same pair especially in graspable object. This indicates that literates have difficulties with mirror invariance, and this effect was the strongest in graspable objects. This means, for illiterates a mirrored object was the same no matter where the handle was, while for literates these two images were different, so their reaction time extended, to remain accurate. This tendency did not appear with non-graspable object, which means literacy change how we see everyday use objects.

## PC-041
## Priming independent and interdependent self-construals modulates the endowment effect in three and four-year-olds

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Gaining ownership of an object will typically result in an increased value or preference for that object. The bias for people to overvalue their own possessions has been labelled the endowment effect. Theoretical perspectives on this effect strongly implicate the role of "self-identity" (Belk, 1998) where personal possessions are valued more because they are perceived as tangible manifestations of the self. In support of this, it has recently been found that the endowment effect varies considerably between cultures with different self-concepts, and that priming of the self-concept can influence the endowment effect in adults from different cultural backgrounds (Maddux et al., 2010).The current study is the first to investigate the developmental origins of the endowment effect and its relationship to self-concepts in young children. Three and four-year-olds evaluated two identical toys using a five-point smileyometer. They then received one of the toys to keep before taking part in either a self-priming task, an other-priming task or a control task. The toys were then revaluated. Children demonstrated equivalence (giving equal value to the toys before ownership was ascribed). After ownership was allocated, a significant interaction was found between

ownership and experimental condition: children valued their own toy higher than identical other toy following self-priming. In addition to the effect on evaluation, endowment effects were also observed in relation to children's willingness to swap their toy. The current results suggest that three and four-year-olds value their own objects higher than identical alternatives when primed towards self-focus and independence. Consequently, this seems to demonstrate that self-priming modulates the endowment effect in young children, indicating that these effects are not unique to adults, but also operate in early childhood.

## PC-042
## How do spontaneous movements with standing affect duration of the standing? Description and prediction from participant observation

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Postural control is an essential ability in developing motor skills needed for daily living activity. Although there are many experimental studies about infant upright posture control, little is known about the effect of infants' spontaneous movements on postural sway or duration of standing. In their daily lives, infants' postures are often perturbed before they accomplish standing, by spontaneous movements such as their rising movement. Their postures are also perturbed by spontaneous movements during standing such as handling objects. One purpose of this study is to describe what kinds of spontaneous movements infants do just before standing, and how they developmentally change in general. The other purpose is to predict which factor of spontaneous movements (of both before and during standing) affect the total duration of standing.

We investigated standing of one infant (10-12 months) during 2-hr naturalistic observations in the infant's home, every week (longitudinal study). In the early stages, the infant pulled up to stand using furniture and released his hands, then accomplished standing. The strategy changed as days go by. He got to stand near his mother, by releasing hands from her lap and pushing himself up. Then, he got to stand in open space frequently.

We chose factors which affect the total duration of standing by using model selection. The model, whose predictive accuracy was the largest, included object handling style (handling objects with One-Hand or Both-Hands or No-Object) and environment of

standing place (standing near supporting objects or in open space). When he didn't handle any object during standing, or when there are no supporting objects within his reach, the standing duration decreased.

Although data collection of other infants is ongoing, these results will help us to better understand what infants do and what is important when they encounter the ecological task of standing.

## PC-043
## The origins of social attention

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We will present a study that investigates the difference in social and non-social attentional processes in adults and young infants. We used a modified version of the Posner paradigm to test whether centrally presented social (eye-gaze) and non-social cues (arrows) guide adults attention to a peripheral target. Instead of using stimulus onset asynchrony (SOA) we varied cue duration. We measured participants' speed at focusing their attention to the peripheral target with an eye-tracker. In Experiment 1, adult participants showed a facilitation effect at 100ms cue duration and an inhibition effect at 700ms cue duration when the centrally presented cue was an arrow. However, in Experiment 2, adults showed a facilitation effect both at 100 and 700ms cue duration when the centrally presented cue was eye-gaze. These results show that while symbolic non-social cues elicit both facilitation- and inhibition-effects, social-cues only facilitate, but do not inhibit, target detection. This suggests that attending social and non-social events may be two different attentional processes. In Experiment 3, we tested 5-month-old infants with the stimuli of Experiment 2 (eye-gaze) and found that infants at that age showed a facilitation-effect with 100ms cue duration and an inhibition-effect with 700ms cue duration. This suggests that social-cues guide young infants' attention in the same way as non-social cues guide adults' attention, and may mean that attending to social cues emerges from more fundamental or basic attentional processes.

## PC-044
## Learning about kinds through non-verbal communicative demonstrations

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Object specific information that is conveyed in ostensive communicative contexts may be interpreted by the child as kind generic and thus about the kind rather than as about the particular object, though the demonstration may be on a single specific object. We tested this hypothesis with 2 sets of 18-month old infants; one set received ostensive-communicative demonstration and the other set received non-ostensive demonstration of eliciting a novel property from an unfamiliar object. Subsequent to the demonstration, the demo object and two other inert test objects (one identical to the demo object and two differently colored objects) were handed over to the infant one by one and the numbers of attempts to elicit the novel property from the objects were measured in a specified time period. Following this test phase, the infants were given all three objects simultaneously to test if they preferred the demo object to the others. We predicted that the infants who received the non-ostensive demonstration would prefer the demo object, as they would have interpreted the property as specific to the demo toy, while the infants who received the ostensive demonstration would not expect exemplars of a given kind to be different with respect to the demonstrated property. In line with our prediction, infants who received the non-ostensive demonstration show a marked preference for the demo object over the other two objects. However this preference was only marginally significant when compared to the group that received ostensive demonstration.

## PC-045
## Can non-speech movements drive monolingual and bilingual infants´ attention from the mouth of a talking face?

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When watching at a talking face, infants from 6 to 10 months of age pay more attention to the mouth rather than to the eyes of the speaker. At 12 months, infants' preference for the mouth over the eyes region is still present but smaller, while their visual attention towards the eyes region increases (Lewkowicz & Hansen-Tift, 2012). During the same period, bilingual infants show a more stable behavior: they focus on the mouth region earlier in their development (at 4-month-old) and this preference

remains unchanged later on (at least until 12-month-old, Pons et al., 2013). The goal of this study was to investigate the flexibility of the different attention pattern observed between monolingual and bilingual infants. We measured whether displaying visual information in the speaker's eyes/mouth influences their visual exploration of talking faces. We recorded monolingual and bilingual 15-month-olds'eye gaze while they watched and listened to a speaker producing short sentences. At the end of each sentence she either protruded her lips (N=30, 16 bilinguals) or raised her eyebrows (N=31, 16 bilinguals). In line with results cited above, bilingual infants showed a more stable pattern of behavior then monolinguals. Monolinguals increased their looking time to the mouth or the eyes region as a function of the condition during the presentation of the sentence itself (Lip-Protrusion vs. Eyebrows condition, respectively) whereas bilinguals looked preferentially at the mouth region, regardless of the condition ($F(1,56)=6.4$, $p<.05$). Both alternative explanations of these results in terms of selective attention and switching abilities are discussed.

## PC-046
## Operational momentum during the representation of ordinal relations in 4- and 12-month-old infants

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The Operational Momentum (OM) is the systematic tendency to overestimate the results in addition problems and underestimate them in subtraction problems. This effect has been found both in adults and in 9-month-olds using non-symbolic numerical quantities, and it is thought to arise from interactions between the spatial and numerical systems, as a side effect of attentional updating along the mental number line. The presence of OM during infancy suggests that the origins of the number-space mapping might not be based exclusively on cultural aspects, but also on biologically determined, early attentional biases. In the current study we asked whether the OM effect is present also for the representation of ordinal relations among continuous quantities in 4- and 12-month-old infants. Using an infant-controlled habituation paradigm, 80 infants (40 in each age group) were habituated to ascending or descending size-based sequences; in the test phase they were presented with an alternation of an against-momentum ordinal sequence and a with-momentum

sequence. Twelve-month-olds looked significantly longer at the against-momentum trials than at the with-momentum trials, while 4-month-olds looked equally long at both ordinal displays, suggesting that by 12 months, but not earlier, the OM phenomenon arises even with continuous quantities. Our findings are in line with the hypothesis that continuous and discrete quantities share a common representational system, and highlight the fact that OM emerges over development.

## PC-047
## Evaluations of fair and unfair individuals at 16 months of age

Talee Ziv, Jessica A. Sommerville
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Early sensitivity to fairness in resource distribution has been revealed through infants' looking time patterns (Sommerville et al., 2013) and their selection of social partners (Burns & Sommerville, 2014), yet it remains an open question whether infants' responses to fair and unfair individuals entail adult-like moral evaluations of good vs. bad. In order to gauge 16-month-olds' explicit evaluations of fair and unfair individuals, participants were first taught that one side of a touch screen emits positive sentences when touched (e.g., "good job!"), whereas the other side of the screen emits negative sentences (e.g., "bad job!"). Infants then saw clips in which one actor distributed resources fairly and another actor distributed resources unfairly. During two 60-second test trials the face of the fair or unfair individual was displayed at the center of the screen while the number of touches infants produced on the positive and negative screen sides was recorded. Participants (n=67) touched the positive side of the screen significantly more often than the negative side when the fair actor was presented ($t(55)=2.84$, $p=.006$). When the unfair actor was presented, infants touched the screen sides equally ($t(61)=1.46$, $p=.15$). Furthermore, even though there was no difference in infants' total number of touches (positive + negative) when comparing the first 20 seconds of the fair and unfair trials ($t(50)=.47$, $p=.644$), results showed a significant drop in total screen touches by the last 20 seconds of the unfair trial ($t(58)=3.29$, $p=.002$), yet the total number of touches stayed stable during fair trials ($t(53)=1.37$, $p=.177$). Our findings reveal that 16-month-olds actively praise fair individuals, but do not yet reprimand unfair individuals. Moreover, infants' pattern of screen touches shows active avoidance of unfair individuals over time.

## PC-048

## Probing the strength of infants' preference for helpers over hinderers: Two replications attempts of Hamlin & Wynn, 2011

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Recent studies suggest that young infants seem already influenced by the moral status of individuals that they could potentially interact with. The current study attempted to replicate the findings obtained by Hamlin and Wynn (2011) about infants' preference for agents who act prosocially towards third parties over those who act antisocially. 9-month-old infants were presented with a live puppet show in which a lion repeatedly failed to open a box to retrieve a toy placed inside. The lion was either helped by a dog to open the box, or hindered by another dog (differing in shirt colour) who slammed the lid shut. Infants were then presented with the two dogs and encouraged to reach for one of them. Differently from Hamlin & Wynn (2011), infants showed no significant preference for the Helper over the Hinderer (15 infants out of 24, $p = .31$). Despite the failed replication, the study allowed for an independent validation of the manual-choice measure, which indeed appeared efficacious in producing the desired behavior (reaching). We are now performing a second independent replication of the same study with a second group of experimenters, using additional procedural details generously provided by Kiley Hamlin's team. Data collection is on-going, and results will be presented at the conference.

## PC-049

## The relation among communicative perspective-taking, false belief, and executive function

Mi-ok Jung, Hyeonjin Lee

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Communicative perspective-taking might be related to theory of mind or executive function. So far, most studies have focused on examining the relation of either communicative perspective-taking and theory of mind, or communicative perspective-taking and executive function. Nilsen and Fecica (2011) recently suggested that both theory of mind and executive function contributed to communicative perspective-taking performance in some interrelated way. This study thus investigated the relation among

communicative perspective-taking, false belief, and executive function in Korean children. Ninety-two 3- and 4-year-old children were tested. Communicative perspective-taking was measured using two communication tasks (i.e., production and comprehension tasks), each of which includes both common- and privileged-ground conditions. False belief understanding was assessed using unexpected content and unexpected location tasks. Executive function, specifically inhibitory control, was measured using conflict and delayed inhibition tasks. As for the communicative perspective-taking, we analyzed children's using adjectives in the production task and children's choosing target objects in the comprehension task. The results revealed that children produced the appropriate adjectives in the common-ground condition significantly more often than in the privileged-ground condition ($t(91)=2.20$, $p<.05$), and chose referential targets significantly more often in the privileged-ground condition than in the common-ground condition ($t(91)=3.99$, $p<.001$). This implies that these children were sensitive to another's perspective in some sense. As for the relation among three variables, regression analysis revealed that children's performance in the communicative production task was predicted by false belief understanding, but not by inhibitory control. It implies that children who possessed more developed mind reading ability could be better able to adopt another's perspective. On the other hand, children's performance in the communicative comprehension task was predicted only by inhibitory control. It implies that the role of inhibitory control seemed to be specific to children's ability to take into account the speaker's perspective.

## PC-050
## Prosody as surface cue in irony processing – A cognitive developmental perspective

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Theory: In our experimental study we explore the role of prosody in children's understanding of irony and explain why prosodic patterns facilitate non-compositional meaning construction at an early age.

Method, materials: We investigate preschoolers' linguistic performance with semantic and pragmatic tasks (including simile, metaphor, verbal humor (riddles, one-liners and jokes), irony, irony with help and control tasks, and a non-verbal

humor task). The linguistic tasks are viewed in relation to children's mentalization skills tested with verbal and non-verbal False Belief Tests to see if ToM skills predict success in pragmatic skills.

Results: We have found that irony is processed with more success by preschoolers than metaphor or humor, due to salient prosody and intonation patterns that serve as surface cues in interpretation. This also clarifies that in cognitive and mental terms irony is not simply a form of humor (as traditional views in humor research and linguistics held), since its processing triggers fairly different cognitive mechanisms than the processing of metaphor and humor, reflecting different patterns in cognitive development. Our findings confirm results in infant research that surface cues help in the recognition of communicative intent, and contribute to the successful resolution of the intended meaning at hand.

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## PC-051
## Delay Improves 3-Year-Olds' Understanding of a Novel Symbol

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Having children wait before or during a cognitive task can have both positive and negative effects (e.g., Marcovitch & Zelazo, 2009). Research on symbolic development exemplifies this paradox; experience with an easy symbol followed by a delay can help children use a difficult symbol (DeLoache, Simcock, & Marzolf, 2004), but a delay between using a symbol can lead to catastrophic failure (Uttal, Schrieber, & DeLoache, 1995). Based on research suggesting delay between trials can help older children use the same symbol (Marzolf & DeLoache, 1994), we investigated whether delay could help 3-year-olds use the same, difficult symbol on two days separated by 24-hours. Three-year-olds used a model as a symbol to find a hidden toy in a room. Children used either an easy model (high-similarity) on Day 1 and a difficult model (low-similarity) on Day 2 (transfer condition), or used the difficult model on both days (delay condition). If delay significantly improves performance, the delay condition should perform poorly on Day

1 compared to the transfer condition due to the difficulty of the models. On Day 2, both conditions should improve their performance, even the children who used the same, difficult model on both days. On Day 1, the delay condition performed worse (57%) than the transfer (75%), showing the effect of model difficulty. Importantly, children in both conditions performed significantly better on Day 2 (84%) than on Day 1 (65%, $p<.05$). In a second experiment, we replicated our results, and showed that children in the delay condition showed elevated performance on Day 2 even without instructions (55% vs. 72%, $p<.05$). These results suggest that the delay can act as a cognitive refresher – mere exposure to the same symbol after a delay may be enough to reduce errors and evoke symbolic competence in 3-year-old children.

# PRE-CONFERENCE SESSION

## PRE-001

# Eye tracking in developmental studies: Introduction to basic methodology and real-time gaze contingency

Estefanía Domínguez Martínez [1,2], Brian Sullivan [1]

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**Introduction**

Experimental design is a fundamental step in any type of scientific research, and experiments involving eye tracking are no exception. A well designed experiment allows the researcher to be able to validate and answer the questions of interest, minimizing the impact of issues like poor data quality in the experimental outcomes. One of Tobii`s focus points is to support researchers in designing their eye-tracking experiments in order them to reach the best data quality standards and ensuring the viability of research results. Moreover, the use of appropriate methods to retrieve and analyze our eye-tracking data can be crucial for this purpose.

**09:00-09:45 – Introduction to Eye Tracking and Applications in Developmental Studies - Brian Sullivan**

We will introduce basic concepts concerning the human visual system and eye-tracking technology, with a focus on eye-tracking research with remote eye-trackers. Common paradigms used in infant research and common experimental design issues related to eye-tracking experiments will be discussed, e.g. limitations in human perception and eye physiology; type of data collected by a remote eye-tracker; and data quality and validation.

**09:45-10:30 – Introduction to gaze contingency in infants– Estefanía Domínguez Martínez**

We will introduce the concept of using the participant's gaze during the experiment to control stimulus presentation in real-time, known as gaze contingency. The presentation will focus on the usefulness of this methodology in infant research, with examples of infant gaze-contingent paradigms and applications. Also, some of the software tools currently available for designing gaze-contingent experiments will be discussed.

## PRE-002

# Eye tracking cognitive development: From idea to evaluation

Pirita Pyykkönen-Klauck [1], Meike Mischo [1], Martin Pötter [1], Paula Rubio-Fernandez [2]

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The workshop introduces the state-of-the-art experimental designs and eye-tracking solutions to study cognitive development across the life-span. We will start by discussing developmental research questions that benefit from eye-tracking methodology. Then, we will share the best practices and experiences from the field, concentrating on the foremost eye-tracking paradigms used with infants, toddlers and older children, and covering important aspects to consider and/or control when designing developmental experiments.

The workshop contains hands-on training with SMI SensoMotoric Instruments eye tracking hardware and software that provide a smooth workflow for designing, conducting and analyzing experimental research in the fields of human development, psychology and education. Participants will program short developmental eye tracking experiments with SMI in-house software ExperimentCenter, learn to operate SMI remote eye trackers to collect data as well as use SMI's in-house analysis software BeGaze. The special focus will be on the tools that are designed to facilitate academic research on human behavior and development such as the composite editor, trigger based areas of interest to calculate eye movement metrics, live participant annotations and the proportion of looks module.

**Content of the training event:**

1. Benefits and constraints of eye tracking methodology in developmental research

2. Important aspects to consider in developmental eye tracking studies
   – News from the field
      a. Sample size, experiment duration and design options
      b. Tasks and instructions for infants and toddlers
      c. Practical solutions with children at different ages

3. Eye tracking infants, toddlers and older children with SMI eye tracking systems

**Hands-on in small groups:**

4. SMI in-house stimulus presentation software ExperimentCenter: Preparation of a preferential looking experiment
      a. Flexible composition of stimulus materials with Composite Editor,
      b. Trigger AOI (areas of interests)
      c. Live annotations of participant behavior

5. Operating SMI eye trackers: Calibration and data collection

6. SMI in-house analysis software BeGaze
      a. Data visualization and descriptive statistics, esp. SMI Proportion of Looks Module
      b. Data outputs for inferential statistics

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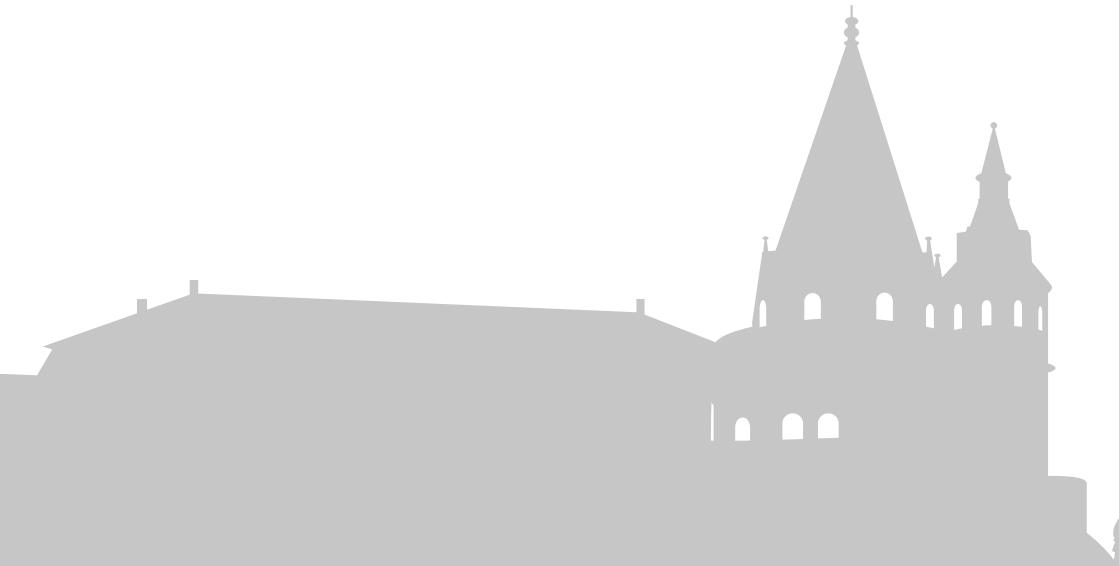

# RESTAURANTS & MAPS

A, Conference venue
- Radisson Blu Béke Hotel
1067 Budapest, Teréz körút 43.

B, 'Eiffel Ice Rink'
1062 Budapest, Teréz körút 55-57.

1. Arriba Taqueria
1067, Teréz körút 25.
www.arriba.hu
*Mexican*

2. Barokko Club & Lounge
1065. Liszt Ferenc tér 5.
www.barokko.hu

3. Braseiro Restaurant
1061 Teréz Krt. 23.
Brazilian

4. Broadway Garden Restaurant and Coffee
1066 Ó utca 43-49.

5. Buena Vista
Liszt Ferenc tér 4-5.
www.buena-vista.hu

6. Cactus Juice Pub & Restaurant
1061 Jókai tér 5.
www.cactusjuice.hu

7. Csirke-fogó
1065 Bajcsy Zsilinszky u. 7.
www.csirkefogo.hu
*Fast food*

8. Dimitrisz Restaurant
1067 Eötvös utca 25/a
www.dimitriszpub.hu
*Fast food*

9. Westend underground food corner
(Don Pepe pizzeria, Istanbul turkish restaurant, Thai restaurant, Chinese restaurant, Nordsee, Mediterranian Grill restaurant)
West End Shopping Center
http://www.westend.hu/hu
*Fast food*

10. Grappa Restaurant
1067 Teréz Krt. 25.

11. Hang Zhou Kínai Chinese Restaurant
1065 Podmaniczky u. 1-3.
*Chinese*

12. Horvát Restaurant
1065 Nagymező u. 49.
*Hungarian*

13. Indigo Restaurant
1066 Jókai u. 13.
www.indigo-restaurant.hu
*Indian*

14. Istambul Turkish Restaurant
1067 Teréz Krt. 23.
www.istanbuletterem.hu
*Turkish*

Balzac u.
Radnóti Miklós u.
Katona József u.
Szent István krt.
Nyugati pályaudvar
Budapest-Nyugati pályaudvar
Váci út
Podmaniczky u.
Szív u.
Szondi u.
Bajnok u.
Rózsa u.
Izabella u.
Kodály körönd
Markó u.
Szalay u.
Alkotmány u.
Kálmán Imre u.
Bathory u.
Jókai u.
Szondi u.
Csengery u.
Eötvös u.
Vörösmarty u.
Aradi u.
VI. kerület
Vörösmarty utca
Teréz krt.
Weiner Leó u.
Lovag u.
Dessewffy u.
Nagymező u.
Hajós u.
Bajcsy-Zsilinszky út
Múzeum Budapest
Oktogon
Mozsár u.
Menza Étterem
Zichy Jenő u.
Arany János utca
Opera
Lázár u.
Révay u.
Andrássy út
Paulay Ede u.
Nagymező u.
Hegedű u.
Kertész u.
Kürt u.
Erzsébet krt.
Dob u.
Szinyei Merse u.
Szécsényi György u.
Szép u.
Szinyei Merse u.
Szécsényi György u.
Szófia u.
Eötvös u.
Király u.
Csengery u.
Hársfa u.
Dob u.
Akácfa u.
Kertész u.
Wesselényi u.
Klauzál tér
Kis Diófa u.
Csányi u.
Kaziczy u.
Hollo u.
Nyár u.
Nagy Diófa u.
Dohány u.
Szimpla Kert
V. kerület
Bajcsy-Zsilinszky út
Mérleg u.
József Attila u.
Erzsébet tér
Deák Ferenc tér
Szabadság tér
Sas u.
Holló u.
Vadász u.
Aulich u.
Szemere u.
Honvéd u.
Nagy Ignác u.
Bihari János u.
Szemere u.
Balaton u.
Tátra u.
Holló Ernő u.
Borbély u.
Kresz Géza u.
Váci út
Nyugati pályaudvar
Budapest-Nyugati pályaudvar
Ferdinánd híd
Szécsényi György u.
Szinyei Merse u.
Kmety György u.
Terézv
Kodály körönd
VI. kerület
Vörösmarty utca
Múzeum Budapest
Szófia u.
Eötvös u.
Teréz krt.
Menza Étterem
Opera
Erzsébet tér
Szimpla Kert
A
B
1/10
2
3/14
4
5
6
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8
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11
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13

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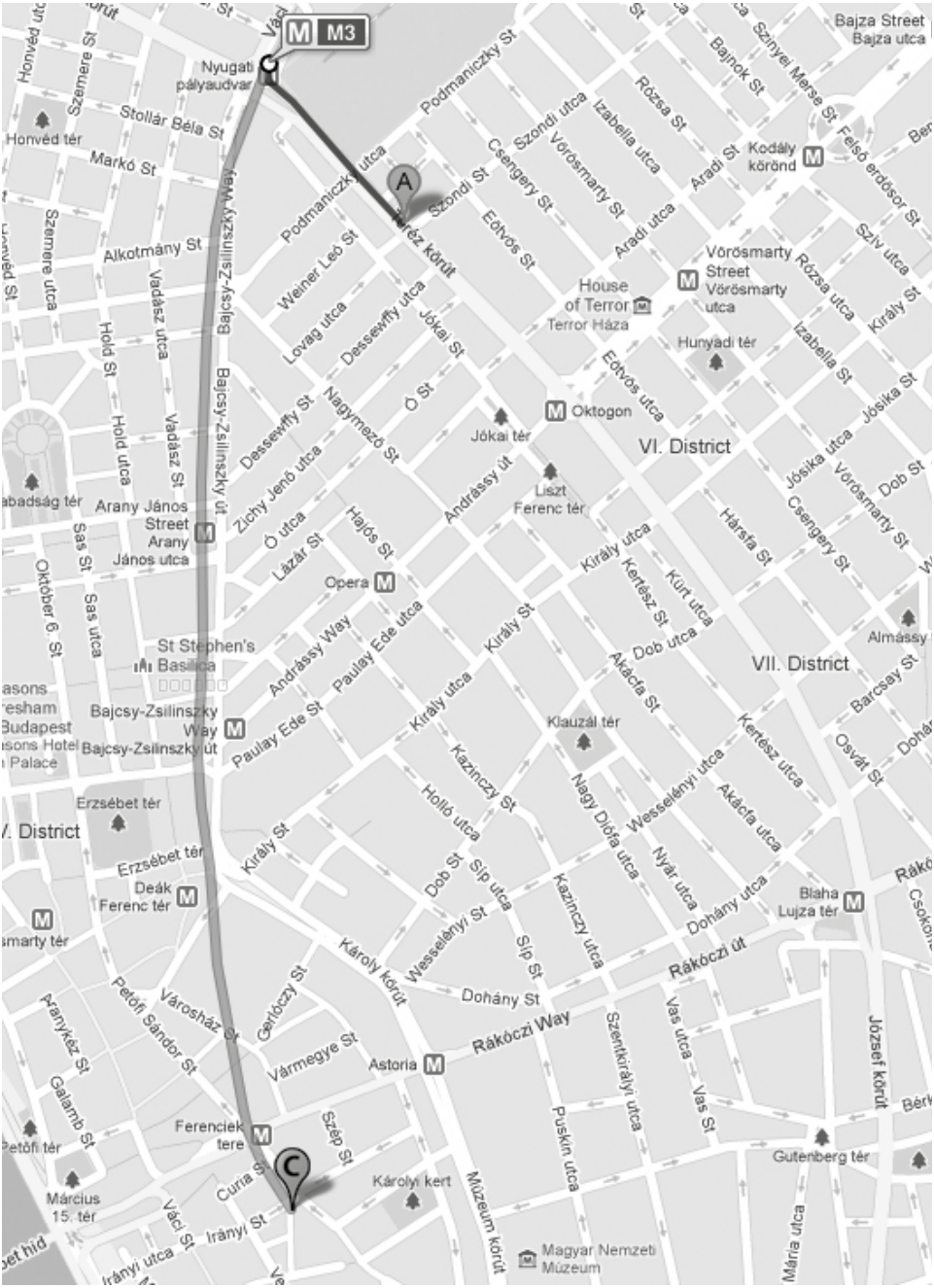
1053 BUDAPEST, KÁROLYI MIHÁLY UTCA 9.
TEL.: +361 266 21 10



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