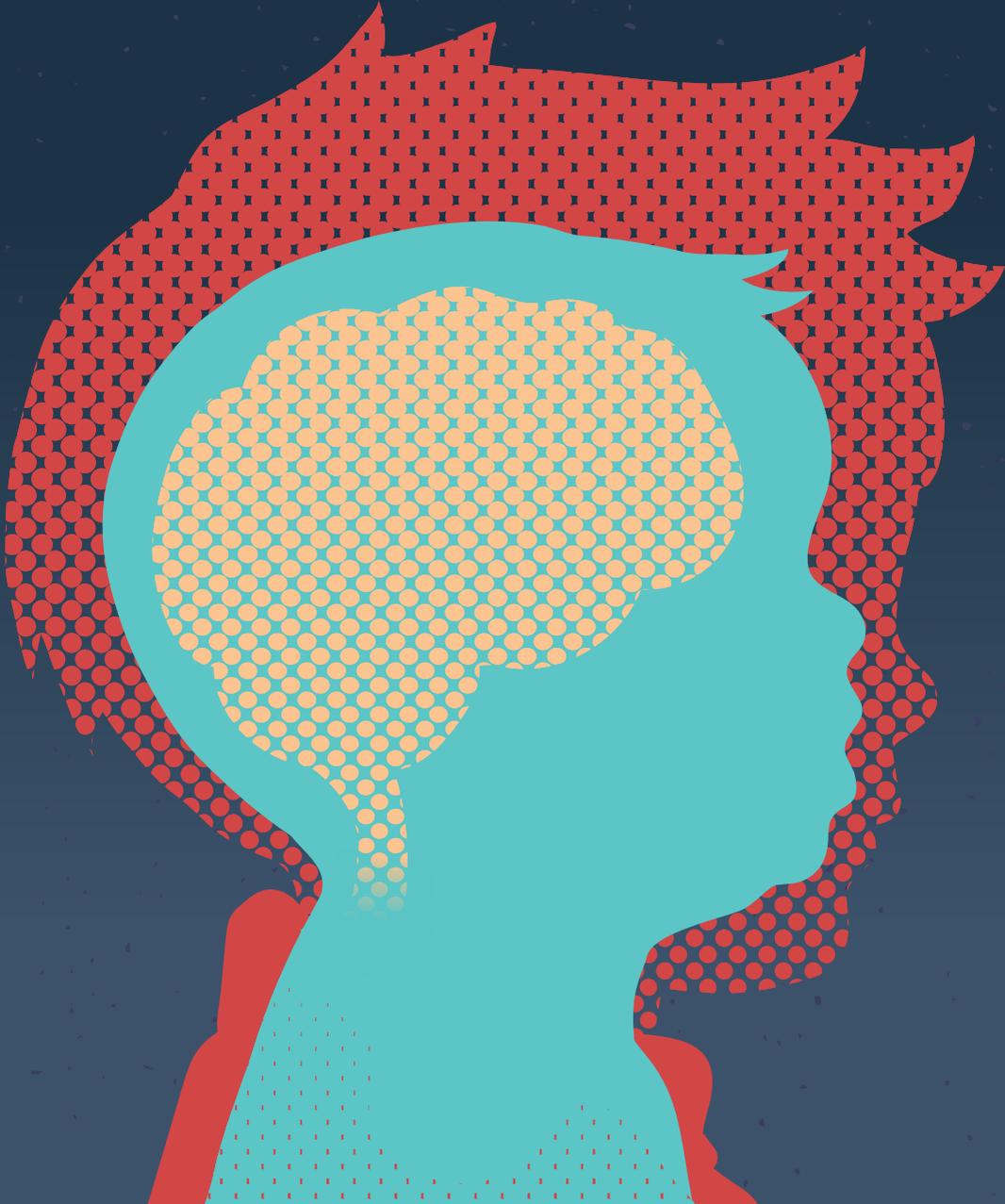




BUDAPEST
CEU CONFERENCE
ON COGNITIVE
DEVELOPMENT

2019 |

PROGRAM
AND ABSTRACTS



	Thursday, 3 rd of January	Friday, 4 th of January	Saturday, 5 th of January
9:00			Invited Lecture 2 Jesse Snedeker <i>Auditorium</i>
9:30	Registration <i>Registration desk</i>	Paper Session 2 Group Dynamics <i>Auditorium</i>	
10:00			
10:30		Coffee break <i>Lobby</i>	Coffee break + Group Photo <i>Lobby</i>
11:00		Paper Session 3 Goals <i>Auditorium</i>	Paper Session 5 Semantics of quantifiers <i>Auditorium</i>
11:30			
12:00	BCCCD Welcome (12:45) <i>Auditorium</i>	LUNCH	LUNCH
12:30			
13:00	Symposium 1 Developmental foundations of analogical reasoning <i>Auditorium</i>	Symposium 2 Underpinnings of sensitivity to referential facts in children <i>Auditorium</i>	Symposium 3 New directions in investigating children's epistemic vigilance <i>Auditorium</i>
13:30			
14:00			
14:30	Poster Session A with coffee & snacks <i>1st floor</i>	Poster Session B with coffee & snacks <i>1st floor</i>	Poster Session C with coffee & snacks <i>1st floor</i>
15:00			
15:30			
16:00			
16:30	Paper Session 1 Causality <i>Auditorium</i>	Paper Session 4 Evaluating evidence & Reasoning <i>Auditorium</i>	Paper Session 6 Prosociality <i>Auditorium</i>
17:00			
17:30	Invited Lecture 1 Carel van Schaik <i>Auditorium</i>	Invited Symposium Development of Working Memory <i>Auditorium</i>	
18:00			
18:30			
19:00	Welcome Reception 19:00 - 21:30 <i>Lobby</i>	Rooftop Mulled Wine 19:30-21:00 <i>CEU Rooftop terrace</i>	
19:30			
20:00			
20:30		Gala Dinner 20:00 - 03:00 <i>Gellert Hotel</i>	
21:00			
21:30			

BCCCD 2019

Budapest CEU Conference
on Cognitive Development

Program and Abstracts

ORGANIZED BY

Cognitive Development Center
Central European University

3-5 January, 2019
Budapest, Hungary
<http://bcccd.org/>

CONFERENCE ORGANIZATION

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

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BC  D



THURSDAY, JANUARY 3rd**09:30-13:00 REGISTRATION****12:45-13:00 BCCCD 2019 WELCOME****13:00-14:30 SYMPOSIUM 1**

Developmental foundations of analogical reasoning and the representation of abstract relations 00

Developmental changes in the detection of sameness and difference between birth and 6 months of age in linguistic and non-linguistic sequences 00
Judit Gervain

Investigating the format of infants' representation of same and different. 00
Jean-Rémy Hochmann

Sameness and symmetry 00
Ruxue Shao, Christian Hoyos, Dedre Gentner

Relational Induction and Relational Matching Tasks 00
Ivan Kroupin, Susan Carey

14:30-16:30 POSTER SESSION A 00
(with coffee & snacks)

16:30-17:30 PAPER SESSION 1

Causality 00

Capuchin monkeys (*sapajus* sp.) infer the location of a hidden causal agent 00
Da Zhang, Juan-Carlos Gomez, Amanda Seed

Ripped by a reward or poked by a stick: Do preschoolers and capuchin monkeys infer causes or learn associations? 00
Zeynep Civelek, Christoph Völter, Amanda Seed

Toddlers provide help specific to the cause of others' failed actions 00
Sophie Bridgers, Sarah Altman, Hyowon Gweon

17:30-19:00 INVITED LECTURE 1

The evolution of intelligence: an evo-devo approach 00
Carel P. van Schaik

19:00-21:30 WELCOME RECEPTION

FRIDAY, JANUARY 4th

9:30-10:30 PAPER SESSION 2

Group Dynamics	00
Infants expect ingroup members to form a united front when facing intergroup conflict Anthea Pun, Susan Birch, Andrew Baron	00
Early-developing Coalitional Preferences: Most male, but not female, pre-verbal infants and pre-schoolers prefer members of larger groups. Erik Kjos Fonn, Joakim Haugane Zahl, Oda Eidjar, Lotte Thomsen	00
Infants' pattern of generalization of social dominance relations is consistent with the structural properties of hierarchies. Nicolas Goupil, Mélanie Brun, Jean-Baptiste Van der Henst, Olivier Mascaró	00

10:30-11:00 COFFEE BREAK

11:00-12:00 PAPER SESSION 3

Goals	
Mu-desynchronization in response to the 'back-of-hand' gesture in social and non-social settings Sriranjani Karthik, Eugenio Parise, Ulf Liszkowski	00
Stopping at Nothing: Can 2-Year-Olds Differentiate Between Interrupted and Abandoned Goals? Alexander Green, Barbora Siposova, Sotaro Kita, John Michael	00
First choice matters: Infants' understanding of preferences when agents make inconsistent choices. Yuyan Luo, Sanghyuk Park, Julia Saak, Kristy vanMarle	00

12:00-13:00 LUNCH

FRIDAY, JANUARY 4th**13:00-14:30 SYMPOSIUM 2**

Underpinnings of sensitivity to referential pacts in children 00

A rabbit by any other name: Lexical alignment in preschoolers' dialogue 00

Laura Lindsay, Zoe Hopkins, Holly Branigan

Struggling with alternative descriptions: impaired referential processing in children with ASD 00

Ekaterina Ostashchenko, Gaétane Deliens,

Philippine Geelhand de Merxem, Mikhail Kissine

Can referents of ambiguous drawings and expressions act as referential pacts? 00

Nera Bozin, Mafalda Batista Da Costa, Erika Nurmsoo

14:30-16:30 POSTER SESSION B 000

(with coffee & snacks)

16:30-17:30 PAPER SESSION 4

Evaluating evidence & Reasoning 00

Preschool Children but not Capuchin Monkeys (Sapajus spp.) extract Overhypotheses from limited Evidence 00

Elisa Felsche, Patience Stevens, Christoph Völter,

Daphna Buchsbaum), Amanda Seed

Toddlers assess the evidential value of their actions 00

Marie Aguirre, Shelby Wicklacz, Anne Rebout, Olivier Mascaró

A developmental perspective on the interplay between pragmatic interpretation and reasoning: the case of illusory inferences from disjunction 00

Rachel Dudley, Emmanuel Chemla, Salvador Mascarenhas

FRIDAY, JANUARY 4th

17:30-19:30 INVITED SYMPOSIUM

Development of Working Memory	00
What makes infants' working memory work? Zsuzsa Kaldy	00
Working Memory Development in the Time-Based Resource-Sharing Model Valerie Camos	00
Object processing in the infant: What we have learned from color priming Teresa Wilcox	00
The developmental dynamics of attention and memory Gaia Scerif	00

19:30-21:00 ROOFTOP MULLED-WINE RECEPTION

SATURDAY, JANUARY 5th

9:00-10:30 INVITED LECTURE 2

**Where does meaning come from?
Natural experiments on the origins of semantic structure.** 00
Jesse Snedeker

10:30-11:00 COFFEE BREAK

10:45 GROUP PHOTO

11:00-12:00 PAPER SESSION 5

Semantics of quantifiers 00

Children's interpretation of 'some': Experimental evidence 00
Katalin É. Kiss, Lilla Pintér, Tamás Zétényi

**A refined description of preschoolers' initial
symbolic number learning** 00
Attila Krajcsi, Edina Fintor, Lilla Hodossy

**Twelve-month-olds use the principle of compositionality
to combine newly learnt quantity labels with familiar
kind labels** 00
Barbara Pomiechowska, Gabor Brody, Erno Teglás, Agnes Melinda Kovacs

12:00-13:00 LUNCH

13:00-14:30 SYMPOSIUM 3

**New directions in investigating children's
epistemic vigilance** 00

**Preschoolers' sensitivity to testimony when seeking
information versus evaluating given information** 00
Erika Nurmsoo, Tara Griggs, Hannah Dickerson

**Preschoolers understand the moral dimension
of factual claims** 00
Emmily Fedra, Marco F. H. Schmidt

**Epistemic vigilance online:
Children's selective trust in websites** 00
Shiri Einav, Alexandria Levey, Priya Patel, Abigail Westwood

**Investigating children's developing understanding
of integrity in others' epistemic practices** 00
Lucas Payne Butler, Hailey M. Gibbs

14:30-16:30 POSTER SESSION C 000

(with coffee & snacks)

SATURDAY, JANUARY 5th

16:30-18:00 PAPER SESSION 6

Prosociality	00
Preschoolers expect prosocial actions from others who shared voluntarily (not involuntarily) Julia P. Friedrich, Marco F.H. Schmidt	00
Common Knowledge Promotes Helping in Young Children Barbora Siposova, Sebastian Grueneisen, Katharina Helming, Michael Tomasello, Malinda Carpenter	00
Return the Favor: Preverbal Infants Represent Direct Reciprocity under Resource Scarcity Lotte Thomsen, Joakim Zahl Haugane, Erik Kjos Fonn, Oda Eidar	00
Competition impedes cooperation in the stag hunt game Keith Jensen, Liam Pollock	00

20:00-03:00 GALA DINNER

BC  D



INVITED LECTURE 1

INVITED PROGRAM

The evolution of intelligence: an evo-devo approach

Thursday, January 3rd, 17:30-19:00

Carel P. van Schaik

Department of Anthropology, University of Zurich, Switzerland

Domain-general cognitive abilities are widespread, and are clearly linked to brain size. Yet, both brain size and cognition vary widely at various taxonomic levels, raising the question why. Our point of departure is the fact that brains are energetically costly and that cognitive abilities must be gradually constructed during development, based on inputs. Richer diets and cognitive buffering of seasonality permit larger brains. So do richer developmental conditions, but especially richer social inputs. Developmental studies of wild orangutans have revealed that their cognitive performance is constructed almost exclusively through socially elicited exploration, and that access to more role models means greater skill repertoires and more individual exploration as adolescents—in a process of cultural intelligence. Examining species differences in orangutans, we also found that the species with richer social inputs had greater problem-solving ability. Where skills produce higher mean and lower variance in energy inputs, cultural intelligence can thus partly explain interspecific brain size variation and how brains and cognitive abilities underwent a dramatic expansion during human evolution.

INVITED LECTURE 2

Where does meaning come from? Natural experiments on the origins of semantic structure.

Saturday, January 5th, 9:00-10:30

Jesse Snedeker

Department of Psychology, Harvard University, USA

The way in which languages encode meaning provides a window into human conceptual structure. A perennial question for developmental psychologists is whether these semantic structures are the result of learning an external language (or a critical input to the process). Most folks study this by looking at the conceptual abilities of prelinguistic infants. I explore these questions by looking at the process of language development and language creation. In this talk, I will draw on data from internationally adopted preschoolers learning a second language, homesigners, and Nicaraguan Sign Language.

INVITED SYMPOSIUM

DEVELOPMENT OF WORKING MEMORY

INVITED PROGRAM

Friday, January 4th, 17:30-19:30

Speakers:

Zsuzsa Kaldy, University of Massachusetts Boston, USA

Valerie Camos, Universite de Fribourg, Switzerland

Teresa Wilcox, Texas A&M University, USA

Gaia Scerif, University of Oxford, UK

Chair:

Agnes M. Kovacs, Central European University, Hungary

What makes infants' working memory work?

Zsuzsa Kaldy

University of Massachusetts Boston, USA

Visual Working Memory (VWM) for objects and their locations underlies the ability to represent, learn, and reason about the visual environment. Every time an infant gazes after a toy that has rolled away or a toddler sorts colorful buttons into little boxes, the knowledge of what is where is paramount. We developed a novel Delayed Match Retrieval paradigm to test infants' VWM capacity for object/location bindings - what is where - that is based on anticipatory gaze responses. Compared to Violation-of-Expectation paradigms that measure passive gaze responses to novelty, our paradigm presents a more challenging, but more ecologically relevant test of VWM, as it measures the ability to use remembered information to make predictions. I will present results from a series of studies with infants between 7 and 30 months of age, tracing the development of information maintenance and updating in VWM. In the second part of the talk I will present our findings using pupillometry in this task. The task-evoked pupil response (TEPR) has long been taken as a sensitive, real-time, involuntary measure of focused attention in adults. We found that the magnitude of the TEPR during memory encoding predicted VWM performance in infants. Pupillometry provides an exciting new way to investigate the interactions between infants' attentive states and their VWM capacity.

Working Memory Development in the Time-Based Resource-Sharing Model

Valerie Camos

Universite de Fribourg, Switzerland

Working memory has a central role in cognitive development and its capacity is among the best predictors of high-level cognition and school achievement. Within the time-based resource sharing model, working memory functioning is constrained by the ability to switch attention between storage and processing to achieve apparently the two simultaneously. The development in the efficiency of this mechanism, named attentional refreshing, is accordingly a major source for the development of working memory capacity. In this talk, I will review the main empirical evidence on the age-related changes in this attentional mechanism. Especially, I will report first how the increase in speed of processing during childhood lead to better recall performance. Indeed, for the same activities, older children would be able to process information faster than younger children. Hence, the former should take a greater advantage from the short pauses left free between processing steps. Second, I will examine changes occurring in pre-schoolers, because pre-schoolers' working memory is not affected by variation in concurrent attentional demand. This finding was taken as evidence that pre-schoolers do not reactivate memory traces through attentional refreshing. Their recall performance should then be dependent on the duration during which traces are passively maintained in working memory.

INVITED PROGRAM

Object processing in the infant: What we have learned from color printing

Teresa Wilcox

Texas A&M University, USA

One of our most basic cognitive capacities is the ability to form coherent representations of objects that persist in the absence of direct perceptual input. The outcome of this process, referred to as object individuation, determines how we think about and act on those objects. Over the past 25 years, developmental scientists have made substantial progress towards understanding the nature and development of object individuation in the infant. Most relevant to the present talk are studies that have demonstrated that infants are more sensitive to some object features, such as shape, than other object features, such as color, when tracking objects through occlusion. Even more interesting, is that despite this developmental hierarchy,

infants can be primed, through select experiences, to attend to color features. Identifying the conditions that support color priming has provided insight into the types of experiences that support infant's learning about objects, and how object knowledge is organized. The outcome of neuroimaging studies has revealed ways in which object processing areas in the infant brain are similar to, as well as different from, those of the mature brain. These studies have also helped us to identify the cortical architecture that supports color priming and infant's emerging capacity to individuate-by-feature. As a whole, this line of research has advanced our understanding of object processing, learning, and the infant brain.

The developmental dynamics of attention and memory

Gaia Scerif

University of Oxford, UK

Attentional control plays a crucial role in biasing incoming information in favour of what is relevant to further information processing, action selection and long-term goals. A cognitive neuroscience approach illustrates how attentional processes are best understood not simply as a control homunculus, but rather as bidirectionally influencing and influenced by prior experience. Work of colleagues illustrates how, from very early in infancy we are equipped with exquisite attentional skills, whose improvement is coupled with increased effectiveness of control networks. Later in childhood, our work suggests that both behavioural and neural indices suggest similarities, as well as differences, in how children and young adults deploy attentional control to optimize maintenance in short-term memory. At the same time, attentional effects on memory are not unidirectional: previously learnt information and resistance to distraction during learning guide later attentional deployment, both in adulthood and in childhood. In conclusion, assessing attentional development and its dynamics point to the bidirectional influences between attention and memory.

BC  D



SYMPOSIUM 1

DEVELOPMENTAL FOUNDATIONS OF ANALOGICAL REASONING AND THE REPRESENTATION OF ABSTRACT RELATIONS

Thursday, January 3rd, 13:00-14:30

Organizer:

Jean-Rémy Hochmann, CNRS – Institut des Sciences Cognitives Marc Jeannerod

Speakers:

Judit Gervain, CNRS – Université Paris Descartes

Jean-Rémy Hochmann, CNRS – Institut des Sciences Cognitives Marc Jeannerod

Ruxue Shao, Northwestern University

Ivan Kroupin, Harvard University

The concepts same and different are central to human thought and reason. Furthermore, they constitute an example of abstract combinatorial thoughts. First, they are abstract relations that are not exclusively tied to any specific domain of knowledge. Second, same and different are linked by negation (i.e., “different” means “not same”), raising the possibility that a representation of different is combinatorially composed. Documenting the development of representations of same and, crucially, of different thus constitutes a probe for the development of a combinatorial language of thought and its relation to the capacity to express compositional concepts in natural language.

Researchers have found that human infants and children succeed at a variety of tasks entailing the relations of same and/or different. Nevertheless, the apparent coherence of this literature hides developmental differences. For instance, 14-month-olds succeed on Matching-to-Sample (MTS) tasks, which require participants to select, among several options, the stimulus that is the same as a target item (A goes with A). MTS only requires an implicit representation of same. In contrast, children have been reported to solve the Relational Matching-to-Sample task (RMTS) only after 4 years of age. RMTS requires selecting the pair of stimuli that instantiates the same relation as a target pair (i.e., AA goes with XX because both pairs instantiate the relation same; BC goes with YZ, because both pairs instantiate the relation different). RMTS requires explicit representations of both same and different. These and other observations open the possibility that representations of same and different change in the course of development.

This symposium will address three critical issues for our understanding of infants' and children's representations of same and different. First, what is the evidence that infants and children represent relations rather than global properties of the stimuli (e.g., symmetry, variability, entropy)? Second, is there unambiguous evidence that infants represent both same and different? Third, how can we characterize the format of representation of these relations?

Gervain provides evidence that neonates are able to learn rules predicated on sameness, but they do not learn about difference. The latter ability appears to develop 6 months later and differs between linguistic and non-linguistic stimuli. Hochmann finds that 11-month-olds represent both same and different. He further shows that these representations are constrained by working memory capacities, suggesting that they are built on representations of individual items. Shao, Hoyos & Gentner investigate the respective roles of relations and symmetry in children's performance on RMTS, arguing that relations rather than symmetry allow success at 4 years of age. Finally, Kroupin & Carey argue that the difficulty of RMTS may not lie in representing the relations same and different, but in considering that they are relevant to the task.

In sum, while all contributions converge on the conclusion that both same and different are represented early in development, several views will be discussed relative to the format of these representations, and whether these representations are continuous from infancy to adulthood.

Developmental changes in the detection of sameness and difference between birth and 6 months of age in linguistic and non-linguistic sequences

Judit Gervain

CNRS – Université Paris Descartes, France

Newborns detect adjacent repetition in speech sequences (ABB: e.g. mubaba; AAB: e.g. babamu) as indexed by left temporal and frontal cortical activation, while random sequences with all different items (ABC, e.g. mubage) don't trigger such a response (Gervain et al. 2008, 2012). In two series of NIRS experiments, the current study shows that monolingual French-exposed 6-month-olds respond to both repetition and random sequences in the bilateral temporal areas when those are realized as speech. This response is observed irrespectively of whether the sequences were bi- or trisyllabic (AA vs. AB; ABB vs. ABC; Berent et al. under review, Radulescu et al. in preparation). By contrast, infants have a greater response to ABB than to ABC sequences in sign language (Figure 1.1 & Figure 1.3),

but to ABC sequences over ABB sequences in a non-linguistic visual control (Figure 1.1 & Figure 1.4; Berent et al. under review). This suggests that the representation of repetition (sameness) remains stable from birth to 6 months of age. The representation of difference, by contrast, starts to emerge by 6 months, and it is modulated by the nature of and experience with the signal. In the language domain, the extraction of regular patterns is of primary importance. The repetition pattern is therefore privileged. Without experience, only repetition is extracted (at birth from speech, at 6 months from sign); several months of experience with speech is needed for the extraction of difference. In non-linguistic signals, difference is privileged, possibly due to its higher informational content.

Investigating the format of infants' representation of same and different.

Jean-Rémy Hochmann

CNRS – Institut des Sciences Cognitives Marc Jeannerod, France

The development of language and logic requires the representation of abstract relations such as same and different. Whereas a number of experimental results suggest that young infants represent the relation same, there exists no convincing evidence that pre-lexical infants can represent the relation different. Furthermore, the format of these representations remains unknown. Whereas same can be represented as the repetition of a variable: for all $V \hat{I} S, \{V V\}$, different requires negation to be represented as not same or as: for all $V \hat{I} S, \{V \text{ not} V\}$.

In this talk, I will present two series of pupillometry experiments (Hochmann & Papeo, 2014), investigating the representation of same and different in 11-month-olds, in the context of learning the structure of syllable sequences. First, I will show that infants can represent a structure defined as a sequence of same syllables followed by a final different syllable. Infants' pupils dilate in response to four identical syllables (e.g., “ba ba ba ba”), when the final syllable is different in most sequences (e.g., “di di ku”; “mi mi mi se”). Second, I will show that infants can represent a structure defined by 4 identical syllables, but not by 6 identical syllables. This suggests that the representation of same is built upon representations of individual items and is therefore constrained by working memory capacities. Together, these results demonstrate infants' ability to represent same and different before the onset of language, and provide information on the format of these representations, presumably built upon variables for individuals.

Sameness and symmetry

Ruxue Shao, Christian Hoyos, Dedre Gentner

Northwestern University, USA

The Relational Match-to-Sample Task (RMTS) (Given AA, choose XX over YZ; and given AB, choose YZ over XX) is challenging for young children (and for non-human primates). Hochmann et al. (2017) found that children did not pass this task until 5-years of age. Christie and Gentner (2014), found that children passed the task at 4-years-old and comparison processes are instrumental in acquiring abstract representations of same. However, (1) Christie and Gentner used a same-only version of the task; and (2) their examples of same were always vertically symmetric, leaving open the possibility that children were relying on symmetry instead of sameness.

To investigate this issue, we ran three experiments. In E1, we found that 4-year-olds can pass mixed same-different versions of the RMTS as well as a different-only version. Next, we tested children's understanding of symmetry. In E2 we gave 3-to-9-year-olds a symmetry match-to-sample task (SMTS) analogous to the same-only RMTS. This task was strikingly difficult for children; not until eight did they pass this task--suggesting that symmetry detection was not the foundation of children's high performance in E1. In E3, we tested the role of comparison in learning the symmetry relation. We first presented 4-and-5-year-olds with four easily-alignable trials and then the same SMTS trials as in E2. Children were significantly better than chance and significantly better than their age-matched peers in E2. In summary, (1) 4-year-olds can pass same-different-RMTS; (2) their high performance is not based on symmetry-detection; and (3) comparison processes support learning symmetry relations.

Relational Induction and Relational Matching Tasks

Ivan Kroupin, Susan Carey

Harvard University, USA

Relational-Match-to-Sample (RMTS, Premack, 1983) is a standard test of reasoning with the relations same and different. Non-human animals and children under five have been shown to fail RMTS in versions where both same and different are used as sample relations (Wasserman et al., 2018; Hochmann et al., 2017). Some (e.g. Penn, et al., 2008) argue this shows failure in young children and non-human animals is a result of representations of same and different differing qualitatively from those of older children and adults.

Smirnova and colleagues (2015; 2015), however, have shown non-human animals (crows, parrots) are capable of spontaneous RMTS success given training on certain non-relational match-to-sample (MTS) tasks. In a series of studies, we show training on these very same MTS tasks also increases relational matching adults in OMTSvRMTS (an ambiguous task where matches can either be made on object features or the relation same) and produces spontaneous success on RMTS in four-year-olds (who otherwise fail).

Given MTS training cannot plausibly change relational representations of children or non-human animals (much less adults), we suggest certain failures on RMTS are a result of not seeing the relations same and different as relevant bases of matching. Preliminary work with adults suggests that whether relations are seen as a relevant basis of matching depends on the dimensions on which the task stimuli vary: Adults are significantly more likely to match on relations in OMTSvRMTS when the objects vary only in size compared to the standard version where objects vary in shape and color.

SYMPOSIA AND
PAPER SESSIONS

PAPER SESSION 1

CAUSALITY

Thursday, January 3rd, 16:30-17:30

Chair:

Tibor Tausin, Central European University, Hungary

Capuchin monkeys (*sapajus* sp.) infer the location of a hidden causal agent

Da Zhang, Juan-Carlos Gomez, Amanda Seed

School of Psychology and Neuroscience, University of St Andrews, UK

When an object emerges from a hidden location, human infants (Saxe, Tenenbaum, & Carey, 2005; Saxe, Tzelnic, & Carey, 2007) and possibly crows (Taylor, Miller, & Gray, 2012) anticipate an agent to be at that location, potentially because they reason the agent caused the movement. It is unclear whether nonhuman primates have similar abilities. In this study, capuchin monkeys ($n=10$) had to infer the location of a hidden agent (the experimenter) to find food in one of 2 boxes to the left and right of a central 'stage', after watching a motion event whose direction was either determined by the agent or not. In the agentic trials, a cylinder was either pushed, raked, rolled, or thrown across the stage by the hidden agent as if he was behind one of the screens behind the boxes (in fact to control for inadvertent cues he was hidden in the middle under the table). In control trials the cylinder moved in a corresponding fashion to each of the agentic trials, but it rolled down a ramp or fell off a block after a shake of the table. We found that the monkeys searched for the food at the side where the agent should be in the agentic trials significantly more often than at the corresponding side in the control trials ($t(9) = 3.538, p=0.006$). This result suggests that the capuchin monkeys are able to attribute motion events to a hidden causal agent and locate him based on the outcome of his action.

Ripped by a reward or poked by a stick: Do preschoolers and capuchin monkeys infer causes or learn associations?

Zeynep Civelek, Christoph Völter, Amanda Seed

University of St Andrews, UK

The ability to infer unseen causes from evidence is argued to emerge early in development and to be uniquely human (Penn & Povinelli, 2007). We explored whether preschoolers and capuchin monkeys could locate a reward based on a hidden causal event or instead relied on arbitrary associations. Three-five-year-olds (N=68) and capuchin monkeys (N=17) were presented with two cups covered with foil. The experimenter performed two events, first in one order (Test) and then in reverse order (Transfer): 1) She hid a sticker/raisin behind a barrier, then showed the subject that the foil covering Cup-A was ripped; 2) She poked in downwards motion behind the barrier with a stick, then showed the subject that the foil covering both Cup-A and B was now ripped. If subjects inferred the cause of the ripped foil, they should search in Cup-A regardless of the order of the events; but if they used an arbitrary rule (e.g., choosing the most recently ripped foil), we reasoned that they should make errors when the order of events was reversed in the transfer. Age significantly predicted children's scores ($F(2,63)=19.46, p<.00$). Four- and 5-year-olds performed significantly above chance in both test and transfer. Three-year-olds performed above chance in the test but not the transfer. Monkeys performed above chance in both test and transfer, but their performance was influenced by the order in which the cups were ripped $F(1,13)=23.63, p<.00$). Our results suggest that both monkeys and 3-year-olds relied on an associative strategy whereas 4-and 5-year-olds used the causally-relevant cue.

Toddlers provide help specific to the cause of others' failed actions

Sophie Bridgers, Sarah Altman, Hyowon Gweon

Stanford University, USA

Humans are motivated to help, but how are we able to help effectively? We investigate 16- to 48-month-olds' abilities to reason about why others fail and offer appropriate help. In three experiments, children observed an adult fail to activate one of two toys because she either (a) used a faulty toy (Wrong Toy condition) or (b) used a functioning toy incorrectly (Wrong Action condition). The critical question was whether children would provide help that addressed the likely cause of the adult's failure either by handing her the other, functional toy (Wrong Toy), or by flipping over the toy to reveal the functional button on the

other side (Wrong Action). In Experiment 1, 24- to 48-month-olds were more likely to hand the adult the other toy in the Wrong Toy than the Wrong Action condition. Although most children in the Wrong Action condition flipped a toy over to show the adult the functional button, they did not preferentially act on either toy, presumably because the toys were identical and thus interchangeable. In Experiment 2 (24- to 48-month-olds), we replicated Experiment 1's key findings using visually and structurally distinct toys; additionally, children in the Wrong Toy condition appeared to infer the specificity of the adult's goal (i.e., "She wants to activate this toy," not "...either toy.") by preferring to act on the toy the adult tried to activate. Experiment 3's results suggest even 16- to 24-month-olds are able to infer the cause of another's failed action and offer help targeting this cause.

PAPER SESSION 2

GROUP DYNAMICS

Friday, January 4th, 9:30-10:30

Chair:

Barbara Pomiechowska, Central European University, Hungary

Infants expect ingroup members to form a united front when facing intergroup conflict

Anthea Pun, Susan Birch, Andrew Baron

University of British Columbia, Canada

SYMPOSIUM AND PAPER SESSIONS

Forming social allegiances within one's group can enhance fitness and survival, as agents with the same goals (eg. protecting territory) may unite and defend each other against rival groups. Although infants are able to keep track of different social groups (eg. Powell & Spelke, 2013; Pun, Birch & Baron, 2016), it is unclear whether infants use social allegiances to predict how agents should behave towards ingroup vs outgroup members when facing intergroup conflict. We investigated whether 17-19 month old infants expect social partners to intervene during a conflict and provide aid exclusively to ingroup members. Infants were introduced to two groups (equal in size and number) and saw one agent from each group independently complete their goal of crossing a platform. When both agents attempted to cross at the same time, they engaged in a conflict. Then, infants saw two scenarios: one in which an ingroup member helped another ingroup member complete their goal of crossing the platform (by pushing the outgroup member off the path) and one in which an ingroup member helped an outgroup member. Infants looked significantly longer when an ingroup member aided an outgroup member ($t(23) = 2.18, p = .03$), suggesting that infants expect ingroup members to be loyal and provide aid only to ingroup members. Furthermore, two additional studies revealed that infants understand that forming social allegiances can enhance 'strength in numbers' when outnumbering a rival group, but only if ingroup members are aware that their group member requires aid during conflict.

Early-developing Coalitional Preferences: Most male, but not female, pre-verbal infants and pre-schoolers prefer members of larger groups.

Erik Kjos Fonn¹, Joakim Haugane Zahl¹, Oda Eidjar¹, Lotte Thomsen^{1,2}

¹Department of Psychology, University of Oslo, Norway; ²Department of Political Science, Aarhus University, Denmark

Both infants and several non-human species use numerical group size as a dominance cue and belonging to a dominant coalition lends critical adaptive benefits among social species, suggesting that early-developing motivations to affiliate with larger coalitions might evolve. In study 1, we showed 3–6-year-olds (N = 56, 32 boys) an animation of two groups with 3 or 2 novel agents moving in synchrony on a touch-screen computer. Next, children were presented with one member of each group and asked to press the one they liked the best, wanted to play with, or wanted to befriend (question type was randomly chosen). As predicted, boys chose the member of the largest group (23/32 children, binomial test, one-tailed, $p = .01$). Surprisingly, we found no such tendency among girls (12/24 children, n.s.). In study 2, we habituated 6–12-month-old infants (N = 100, 50 boys) to the animation used in study 1. Next, we administered a reaching task such that a blind experimenter lifted one member from each group out a styrofoam-blind that was lowered to cover the large display-screen between trials, allowing infants to choose between the two figures. Paralleling results among pre-schoolers, the majority of male infants again reached for the member of the large group (32/50 infants, binomial test, one-tailed, $p = .0325$), while girls again chose randomly between the two (25/50 infants, n.s.).

SYMPOSIUM AND
PAPER SESSIONS

Infants' pattern of generalization of social dominance relations is consistent with the structural properties of hierarchies.

Nicolas Goupil, Mélanie Brun, Jean-Baptiste Van der Henst, Olivier Mascaro

Institute for Cognitive Sciences Marc Jeannerod, France

In principle, social dominance structures can take a great variety of structural shapes (e.g., chains, rings, trees or grids). Yet, across species and societies, dominance hierarchies tend to converge on a restricted set of structural forms, usually stratified pyramids composed of transitive relations, with fewer individuals at the top than at the bottom of hierarchies and with groups dominating other groups. In this project, we aim at pinpointing the basic cognitive processes underpinning these structural regularities by investigating infants' expectations about the way social dominance generalizes across allies. In two studies,

we familiarize 14-month-olds to 2D animations showing that (i) one agent (the dominant) is dominant over another one (the subordinate), and that (ii) the dominant and the subordinate agents each have a different ally. During the test phase, infants look significantly longer when the dominant is subordinate to the subordinate's ally than when the opposite happens ($W = 20$, $p = .02$; Wilcoxon signed rank test). In contrast, infants do not look significantly longer when the subordinate dominates the dominant's ally than when the opposite happens ($W = 70$, $p = .82$; Wilcoxon signed rank test). These results suggest that infants expect subordination to an individual, but not dominance over an individual, to generalize across allies. By itself, this simple pattern of expectations contributes to explain three key properties of social hierarchies: their pyramidal shape, their stratification, and the transitivity of social dominance relationships.

PAPER SESSION 3

GOALS

Friday, January 4th, 11:00-12:00

Chair:

Hanna Marno, Central European University, Hungary

Mu-desynchronization in response to the 'back-of-hand' gesture in social and non-social settings

Sriranjani Karthik¹, Eugenio Parise², Ulf Liszkowski¹

¹University of Hamburg, Germany; ²Lancaster University, UK

Infant electroencephalography (EEG) studies on goal-directed action understanding have hitherto focused on object-directed, instrumental actions such as reaching and grasping, showing mu desynchronization around central areas for self-executed and observed actions. However, contextual factors of goal attribution have rarely been investigated. We placed the back-of-hand gesture, typically used as control (Southgate et al., 2010), either into a social context ascribing it a 'request' gesture, or into a non-social context, remaining meaningless. We asked whether social-contextual information could overturn an action interpretation from meaningless to meaningful. mEEG was recorded from a group of adults and 9-month-old infants while they watched short videos of social and nonsocial situations, where a person displayed the back-of-hand gesture. Infants also performed an action execution task, where they grasped colourful objects. The adult data revealed greater mu desynchronization (8-13Hz) in the central and parietal regions in the social condition compared to the nonsocial condition and to the baseline (all $p < 0.05$; $N=15$). For infants, during action execution, there was significant mu attenuation (6-9Hz) in the right centro-parietal region compared to the baseline ($p < 0.01$; $N=21$). For action observation, there was greater mu desynchronization in the same region in the social condition compared to the nonsocial condition ($p < 0.05$; $N=18$) and to the baseline ($p < 0.07$). These results support the 'prediction theory' (Kilner et al., 2007) of action understanding and suggest that the mirror neuron system is involved in predicting social action goals, even when the object is not touched and the action is not yet developed in the action repertoire.

Stopping at Nothing: Can 2-Year-Olds Differentiate Between Interrupted and Abandoned Goals?

Alexander Green, Barbora Siposova, Sotaro Kita, John Michael

University of Warwick, Coventry, UK

The ability to attribute goals to others emerges early in the first year of life (Csibra, 2008; Liu & Spelke, 2017; Luo & Baillargeon, 2005; Sommerville, Woodward, & Needham, 2005; Southgate & Vennetti, 2014). Because most research on goal attribution in early childhood implements experimental scenarios in which the target agent's goals remain constant, little is known about how young children update their goal attributions over time. In particular, we do not know whether children are sensitive to the distinction between abandoned goals and interrupted goals.

To test this, we developed an instrumental helping paradigm in which we manipulate the experimenter's reason for not completing a goal-directed action. In test trials the experimenter begins to place a toy into a box (initial location). In the abandoned goal condition, the experimenter then states that he would rather place the toy in another box (alternative location). In the interrupted goal condition, the experimenter encounters an obstacle which prevents him from reaching the initial location. We measure where children help place the toy (initial vs alternative location).

We tested 18-30 month-olds in the pilot study (N = 13; August, 2018). The odds of helping to place the toy in the initial location were roughly four times smaller in the abandoned goal condition than in the interrupted goal condition (OR = 0.21). These results suggest that children recognise the difference between interrupted and abandoned goals, and that this guides their helping behaviour. Data collection of the main pre-registered study is estimated to finish in December 2018.

First choice matters: Infants' understanding of preferences when agents make inconsistent choices.

Yuyan Luo, Sanghyuk Park, Julia Saak, Kristy vanMarle

University of Missouri, USA

We define a preference as a dispositional state that helps explain why an agent chooses a particular goal-object with another option available. Many research efforts examining infants' understanding of agents' preferences use situations in which the agent makes consistent choices between two options. When an agent consistently chooses object-A

but not object-B, infants seem to attribute to her a preference for A over B. Little is known, however, about how infants understand the agent's preferences when she makes inconsistent choices. A previous study found that after seeing an agent choose A three times consecutively but B once (at the ratio of 3:1; order counterbalanced) during familiarization, 8.5-month-olds seemed to accept that she had no preference because they looked similar amounts of time when the agent chose A or B during test (Luo et al., 2017). The current study examined situations in which the agent's choices were presented at the ratio of 4:1, that is, the agent chose A four times consecutively but B only once (order counterbalanced). The results showed that 8.5-month-olds seemed to consider the agent's first choice between the two options as her preferred object, regardless of whether it was chosen once or four times consecutively during familiarization (Bayes factor = 0.0785). Infants responded with prolonged looking when the agent picked the non-preferred object during test. Therefore, infants might consider an agent's first choice between two options, together with the proportion of her choices (75% or 80%), to make sense of her actions in terms of preferences.

SYMPOSIUM 2

UNDERPINNINGS OF SENSITIVITY TO REFERENTIAL PACTS IN CHILDREN

Friday, January 4th, 13:00-14:30

Organizers:

Nera Bozin, University of Kent, UK

Ekaterina Ostashchenko, ACTE/LaDisco & UNI, Université libre de Bruxelles, Belgium

Speakers:

Laura Lindsay, University of Edinburgh, UK

Ekaterina Ostashchenko, ACTE/LaDisco & UNI, Université libre de Bruxelles, Belgium

Nera Bozin, University of Kent, UK

Discussant:

Bahar Koymen, The University of Manchester, UK

When people interact in conversations, they tend to align conceptually and semantically. They reuse the same expressions as their partners, showing adherence to referential pacts. Several psycholinguistic studies have explored if previously used expressions depend on beliefs about partner's perspective or if they are more egocentrically anchored. These studies usually examine reaction times for reaching for the referent after hearing a target expression. Adult meta-analysis of studies shows that there is the same partner advantage for the aligned expressions, different partner advantage for new expressions, and faster response times to aligned expressions regardless of the conversational partner (Kronmüller & Barr, 2015).

To date, research with children has not shown clear results. While Matthews, Lieven and Tomasello (2010) found that three-year-olds adhere to referential pacts, more recent studies paint a different picture. Graham, Sedivy and Khu (2014) report similar findings only when an implicit, eye-tracking measure was used. Similarly, Ostashchenko and colleagues (in press) did not find referential pact sensitivity in reaction times or explicit children's choices. In this symposium, we delve into children's sensitivity to referential pacts in more detail to determine to what extent do children show sensitivity to referential pacts.

The first speaker, Laura Lindsay, will present findings on how the choices of three and four year-olds are sensitive to their partner's referential expressions. Her set of studies

explore children's use of referential expressions with the aim of disentangling the reason behind the children's choices of referential expressions. More specifically, do children use expressions because they remember a specific referent, have a tendency to use more favourable name, or connect expressions with specific conversational partners?

As it is still not clear whether referential pacts are underpinned by perspective-taking abilities, research with children with ASD could further explain the factors that shape referential pacts. Ekaterina Ostashchenko's talk will investigate whether children with Autism Spectrum Disorder adhere to referential pacts and discuss the role of ASD in children's abilities of taking conceptual perspectives.

Finally, Nera Bozin will explore the definition of referential pacts. Referential pacts generally involve a relationship between the speaker, the referent, and the expression. Unlike previous work which focused on changing speakers and expressions, in her study pacts were broken by keeping the expression but changing the referent. Moreover, she explored whether referential pacts are specific to language or expected with other symbols, such as drawings.

The symposium will reveal how children take into account memory, speaker's perspectives, and referential aims when taking part in conversations. The findings with typically developing children, children with ASD and the results from research with symbols will help understand how referential pacts are formed. Our discussant, Dr Bahar Koymen, will extend these findings to other kinds of communication and discuss the involvement of common ground.

A rabbit by any other name: Lexical alignment in preschoolers' dialogue

Laura Lindsay, Zoe Hopkins, Holly Branigan

University of Edinburgh, UK

During conversation, speakers must decide how to refer to objects (rabbit vs. bunny). Adults' choices are sensitive to a partner's referential precedents: They tend to align (or entrain) on whichever alternative their partner has previously used. In four experiments, we examined whether 3-4-year-olds' referential production is flexible and sensitive to referential precedents, and the nature of the mechanisms that might underlie such alignment. Participants (n=24 per experiment) played a picture-naming game with an adult. We manipulated the name the adult used (favoured: rabbit vs. disfavoured: bunny), and examined children's likelihood of subsequently producing the disfavoured name. In E1, the child named the same picture as the adult. In E2, they named a different picture of the same object (e.g., a different rabbit). E3 replicated E2, except children named all objects (hence

establishing their own precedent) before the game. E4 replicated E3, but children named objects with one partner, then played the game with a different partner. In all experiments, children were more likely to use the disfavoured name if the adult had previously used the disfavoured name than the favoured name, regardless of whether that adult was involved in establishing the initial precedent.

Our experiments show that preschoolers' referential choices are flexible, and sensitive to their partner's previous usage. Children aligned with a partner's precedent even when this meant overcoming their default preference, but showed no partner-specific effects. These results converge with previous adult findings, and suggest preschoolers' referential choices are underpinned by lexical priming mechanisms rather than perspective-taking.

Struggling with alternative descriptions: impaired referential processing in children with ASD

Ekaterina Ostashchenko, Gaétane Deliens, Philippine Geelhand de Merxem, Mikhail Kissine

ACTE/LaDisco & UNI, Université libre de Bruxelles, Belgium

Background: Children and adults with Autism Spectrum Disorder (ASD) show a tendency to reuse referential descriptions previously used by their conversational partner (lexical entrainment). However, such a tendency may become maladaptive in a situation of interaction with different partners who may

introduce alternative lexical descriptions for the same referent. Methods: Six-year-old children with ASD, as well as mental- and verbal-age-matched typically developing (TD) controls moved items on a touch-screen following instructions by an experimenter. During the entrainment phase the experimenter established lexical descriptions for all the items. Then, either the original experimenter or a new partner, depending on the condition, broke established referential precedents for some items. Accuracy and time to locate items referred to with maintained and broken precedents were measured. Results: Relative to TD children, children with ASD had more difficulty in recognizing and interpreting referential description in the challenging context of previous entrainment of a semantically related competitor. Whereas in both TD groups on-line performance and faster processing were predicted by chronological age, the task proved challenging for the ASD group independently of their age and non-verbal intellectual abilities. No partner effect in reacting to broken precedents was present in any group. Conclusion: Referential processing in ASD is compromised by impaired ability to confront alternative conceptual perspectives. A potential executive source for these difficulties is discussed.

Can referents of ambiguous drawings and expressions act as referential pacts?

Nera Bozin, Mafalda Batista Da Costa, Erika Nurmsoo

University of Kent, UK

Children expect speakers to use consistent expressions when referring to a particular target. These referential pacts involve a relationship between the individual, the expression, and the referent. To date, studies have explored one facet of this: children expect the same individual to use the same expression (e.g., Matthews et al, 2010). We test whether, given the same individual and expression, children expect the same referent. We tested this in both language and drawings in a between participants design with 66 three- to five-year-old children. One partner established the initial meaning by referring to the target using an ambiguous expression (e.g., 'the round one'; Language condition) or by clearly drawing a target (e.g., a circle as a ball; Drawing condition). The same partner or a new partner used the same expression (e.g., 'the round one' or the circle) to request an object from an array including either the original object or a new, similarly shaped object (e.g., a plate). Children showed no partner sensitivity as their reaction times and error rates did not differ when they chose referents with the same or a new partner. When given either ambiguous expressions or drawings, children showed no difference in reaction times when choosing either the original or new object. The findings show that children will accept two different referents for the same symbol (e.g., Allen et al, 2016). Importantly, they also suggest that relationships in referential pacts between the person, the symbol, and the meaning, might not have equal weights.

PAPER SESSION 4**EVALUATING EVIDENCE & REASONING**Friday, January 4th, 16:30-17:30**Chair:**

Erno Teglas, Central European University, Hungary

Preschool Children but not Capuchin Monkeys (*Sapajus* spp.) extract Overhypotheses from limited Evidence**Elisa Felsche¹, Patience Stevens², Christoph Völter¹, Daphna Buchsbaum³, Amanda Seed¹**¹University of St Andrews, UK; ²Carnegie Mellon University, USA; ³University of Toronto, Canada

The use of abstract higher-level knowledge (e.g. overhypotheses) allows humans to learn quickly from sparse data, and make predictions in new situations. Children can form abstract rules at a very young age with some evidence from violation of expectation procedures suggesting that even preverbal infants possess this ability (Dewar and Xu, 2010). Given its early onset in human development the question arises if this ability is shared with other species. However, the debate about whether non-human animals form abstract concepts remains unsettled, both because of mixed results and different interpretations of positive results following long training regimens.

To investigate the evolutionary and developmental origins of rule abstraction, we developed a task to directly compare capuchin monkeys and 3- to 5-year-old human children in a choice procedure with very limited evidence, to see if participants extract abstract rules governing reward distribution. In each study subjects experienced 3 to 4 populations (containers, foraging boxes or bandits) in which rewards were either mixed or uniform. Over the course of two studies, we found that children (n=331) extracted overhypotheses to efficiently guide their choices in new situations, for example, they switched sooner after experiencing poor examples from a new population in the uniform condition compared to the mixed condition (t-test, $t(184)=4.45$, $p < 0.001$). In one comparative study conducted so far, we did not find evidence for abstract rule formation in capuchin monkeys. Overall, these results hint towards an early developmental onset and a recent evolutionary emergence of this ability.

Toddlers assess the evidential value of their actions

Marie Aguirre, Shelby Wicklacz, Anne Reboul, Olivier Mascaro

Institute for Cognitive Sciences Marc Jeannerod, France

Efficient information search is observed in many species. Remarkably, humans do not just use fixed information search strategies, and can also discover new behaviors to collect valuable evidence. One way to achieve this feat is to assess the quality of evidence resulting from future actions. This research project focuses on the developmental origins of this capacity in toddlers, by testing their ability to evaluate an action's informativity, i.e., the reduction of uncertainty over a set of hypotheses that it causes. The participants, toddlers of 2-3 years (N = 64), had to find one target character hidden among three distractors. By manipulating the context (i.e., the characteristics of the distractors), we modified the potential informativity of the toddlers' actions. In the first study, we manipulated whether looking at symbols placed below the items was sufficient to identify the target character. In the second study, we evaluated toddlers' capacity to act in an adaptive way to find the target, which was distinguishable either by the sound it made or by a symbol attached to it. The results revealed that toddlers (i) are capable of finding the specific character, (ii) react differently depending on the information available, (iii) change their search strategy efficiently depending on the kind of data needed to resolve their ignorance. These results suggest that toddlers evaluate the informativity of their actions. This capacity is crucial to support creative active learning and hypothesis testing.

A developmental perspective on the interplay between pragmatic interpretation and reasoning: the case of illusory inferences from disjunction.

Rachel Dudley^{1,2,3,4,5,6,7}, Emmanuel Chemla^{2,3,4,5,6,7}, Salvador Mascarenhas^{1,3,4,5,6,7}

¹Institut Jean Nicod, France; ²Laboratoire de Sciences Cognitives et Psycholinguistique, France; ³Dept. d'Etudes Cognitives, France; ⁴ENS, France; ⁵PSL University, France; ⁶EHESS, France; ⁷CNRS, France

Adults make conclusions that do not follow from logical considerations. Given a set of premises involving disjunction, such as “Either Jane is eating and she is reading or Mark is cooking and he is singing” and “Jane is eating”, adults will conclude “Jane is reading” even though this does not follow. Competing theories identify different sources for these illusory inferences from disjunction: (i) reasoning-based accounts argue that these are errors based on fallible reasoning heuristics while (ii) interpretation-based accounts argue that

they follow from reasonable interpretations of the premises, involving regular pragmatic types of enrichments associated with disjunctions. A developmental comparison provides fruitful ground to test the interpretation-based theories, because adults and children differ in their enriched interpretations of disjunctions. While adults tend to interpret “X or Y” exclusively, as “X or Y but not both”, children interpret it conjunctively, as “X and Y”. Using a preference-based task with simple language and visual aids (instead of traditional binary judgment tasks), we tested 5-6 year-olds, asking whether they make illusory inferences despite this difference in interpretations from adults. In a disjunction condition, we replicated previous finding that children preferred images which made both disjuncts true, in line with their documented conjunctive interpretations. In an illusory premises condition, children preferred images which were not compatible with illusory inferences. A coherent view then is that illusory inferences in adults are due to their interpretation of disjunction, and that they are absent in children because they lack the relevant interpretation.

PAPER SESSION 5

SEMANTICS OF QUANTIFIERS

Saturday, January 5th, 11:00-12:00

Chair:

Eszter Szabo, Central European University, Hungary

Children's interpretation of 'some': Experimental evidence

Katalin É. Kiss, Lilla Pintér, Tamás Zétényi

¹Research Institute for Linguistics of the Hungarian Academy of Sciences, Hungary; ²Pázmány Péter Catholic University, Hungary; ³Budapest University of Technology and Economics, Hungary

Children's problems with the computation of scalar implicatures is attributed to their pragmatic immaturity. However, the computation of scalar implicatures based on the scale significantly exceeds the difficulty of scalar implicatures of other types, i.e., it represents an unexplained additional problem. We argue that the source of children's difficulties with some and néhány, its Hungarian equivalent, is that some is ambiguous. It has a non-partitive interpretation, corresponding to 'a few', which forms a scale with many, and a partitive reading, corresponding to 'a subset of', which forms a scale with all. The two variants are selected by different predicates, and in Hungarian, they occur in different structural positions. For adults, the position, prosody, and internal structure of the some phrase, and/or the selectional properties of the predicate determine the interpretation of some. We hypothesized that young children are not sensitive to the partitivity feature of some arising in different contexts; they first acquire the easier, non-partitive reading, which they overgeneralize. The talk presents two experiments confirming this hypothesis. Experiment 1, a forced choice sentence-picture matching task, has shown that the primary, default reading of some NPs for six-year old Hungarian children is the 'a few' interpretation. Experiment 2, a TJV task, has demonstrated that children also accept the 'not all' interpretation of some, and the acceptance rates of the two readings are roughly the same irrespective of the partitivity feature determined for the some phrase by the context.

A refined description of preschoolers' initial symbolic number learning

Attila Krajcsi¹, Edina Fintor², Lilla Hodossy³

¹Department of Cognitive Psychology, Institute of Psychology, Eötvös Loránd University, Hungary;

²RWTH Aachen University, Germany; ³Laboratory of Action and Body, Department of Psychology, Royal Holloway, University of London, UK

The Give a number task is used to characterize the initial symbolic number knowledge of preschoolers. The task is intended to identify critical phases of number processing development. Here, a modified version of the task was used with which it is possible to describe additional properties of number development. First, measuring 3- and 4-year-old children it was confirmed that, in contrast with the mainstream supposition, there are 5-, 6-, 7- and 8-knowers, revealing subset-knowers understanding numbers larger than 4. This result may question the role of the Object Tracking System in the initial symbolic number learning. Second, it was found that in subset-knowers, the performance typically did not drop suddenly after a specific number, instead, the correct response rate decreased gradually. This result suggests that the Approximate Number System account should be reformulated. Also, the results imply that the widely used titration method in the task together with the noise of the measurement may be imprecise. Overall, (a) we offer a more valid version of the Give a number task, (b) we propose a modified description of initial symbolic number learning, and (c) we suggest modifications for the current accounts of initial symbolic number learning in preschoolers.

Twelve-month-olds use the principle of compositionality to combine newly learnt quantity labels with familiar kind labels

Barbara Pomiechowska, Gabor Brody, Erno Teglás, Agnes Melinda Kovacs

Central European University, Hungary

The meaning of complex expressions (“two apples”) is derived from the meaning of its constituents (“two”, “apples”) and the structure of the expression. Here, we explored whether preverbal infants apply this principle to compute the meaning of complex noun phrases composed of a familiar common noun and a newly learnt quantity label.

Experiment 1 demonstrated that 12-month-olds were able to learn two distinct quantity labels denoting a singleton and a pair. At training, infants saw scenes depicting the target concepts: e.g., 1 duck placed in one location and 2 ducks placed in another location. Both referents were subsequently pointed at and named with a pseudo-word for the singleton

(“moxi duck”) and another pseudo-word for the pair (“dax duck”). At test, infants generalized the quantity labels to arrays of new objects.

Experiment 2 demonstrated that infants compose the meaning of the quantity labels with the meaning of kind labels. We used the same training as in Exp. 1 followed by a compositionality assessment: presented with four potential referents (1 duck, 2 ducks, 1 ball, 2 balls), infants oriented to the target satisfying the meaning of both labels (one ball) over the distractors satisfying the meaning of the labels separately (two balls, one car).

Our findings suggest that preverbal infants combine newly learned quantity labels with familiar kind labels. Such competence, and the complex thoughts it supports, may be at the origin of the powerful combinatorial apparatus serving language learning and human reasoning in general.

SYMPOSIUM 3**NEW DIRECTIONS IN INVESTIGATING CHILDREN'S EPISTEMIC VIGILANCE**Saturday, January 5th, 13:00-14:30**Organizers:**

Lucas Payne Butler, University of Maryland, USA

Speakers:

Erika Nurmsoo, University of Kent, UK

Emmily Fedra, LMU Munich, Germany

Shiri Einav, University of Nottingham, UK

Lucas Payne Butler, University of Maryland, USA

The earth is flat. Vaccines cause autism. Heavier objects fall faster. Boys are better than girls at math. What makes each of these claims similar? Each, while theoretically possible and in some cases even intuitive, is empirically false. A pressing issue facing society is ensuring a populace that approaches the world with a critical, evaluative lens: able to assess whether a wide variety of claims are supported by sufficient data; to understand when to dig deeper to better understand a problem, and how best to do so. These are empirical habits of mind, and form the foundation not only of scientific literacy, but of critical engagement across many aspects of modern life. As they become members of a society increasingly inundated with information, with eroding and sometimes insufficient institutional checks on what is authoritatively true, it is crucial to ensure that our children develop these empirical habits of mind.

In the philosophical and psychological literature, investigations into this type of reasoning, and especially its development, has been variously referred to as “selective trust” (Harris, 2012; Harris, Koenig, Corriveau, & Jaswal, 2018) “epistemic cognition” (Greene, Sandoval, & Braten, 2016), and “epistemic vigilance” (Sperber et al., 2010). This symposium showcases three sets of recent investigations into different aspects of epistemic vigilance. Paper 1 revisits the classic selective trust paradigm, investigating whether the process underlying children’s evaluation of given information and their choice of who to ask for information may represent distinct skills. Paper 2 explores the moral dimension of epistemic vigilance, specifically investigating whether children have normative expectations about how factual claims ought to be made. Paper 3 extends the investigation of children’s epistemic vigi-

lance to the digital world, exploring whether children who are just beginning to develop digital literacy show the capacity to apply their skills in epistemic vigilance to information in digital domains. Paper 4 presents a novel theoretical framework for investigating epistemic vigilance, in particular whether children understand key principles underlying intellectual integrity and honesty. Taken together, the papers in this symposium lay the groundwork for a number of important lines of research into how children develop the skills to be epistemically vigilant in the modern world.

Preschoolers' sensitivity to testimony when seeking information versus evaluating given information

Erika Nurmsoo, Tara Griggs, Hannah Dickerson

University of Kent, UK

When deciding whether to trust information, children judge speakers' prior reliability (e.g., Koenig & Harris, 2005), or access to information (e.g., Nurmsoo & Robinson, 2009). In the typical paradigm, information is offered by two contrasting speakers, and children are invited to select the testimony they endorse. When seeking information, such as when choosing who to ask, findings are mixed. In some paradigms (e.g., Koenig & Harris, 2005), children seem to be appropriately selective when deciding between speakers who differ on reliability. In others, where speakers differ on information access, children fail to ask the better-informed speaker (e.g., Robinson, Butterfill & Nurmsoo, 2011). In the present work, we examine children's performance in an endorse vs ask task. Four- and 5-year-old children observed two puppets providing information about hidden toys. At test, children either heard the puppets offer conflicting testimony and judged who to believe (endorse trials), or were invited to seek testimony from one or the other puppet (ask trials). Children found the Ask condition more difficult than the Tell condition, suggesting that their understanding of knowledge is not fully captured by the typical testimony paradigm.

Preschoolers understand the moral dimension of factual claims

Emmily Fedra¹, Marco F. H. Schmidt^{1,2}

¹LMU Munich, Germany; ²University of Bremen, Germany

Research on children's developing moral understanding has focused on their evaluation of others' intrinsically harmful (non-)verbal actions (e.g., hitting, lying). Simple factual as-

sertions, however, may have a moral dimension, too. In the present study we investigated in two experiments how preschoolers (4- to 5-year-olds) evaluate morally relevant factual claims.

In Experiment 1, 24 children witnessed a puppet making incorrect claims (“I say that is an X!”; e.g., labeling a pen incorrectly as a cat) that would lead to harm (another puppet was taking away her gems) or to no harm (a paper ball was taken away). In Experiment 2, 24 children witnessed a puppet making an incorrect assertion that would always produce harm, but the puppet either intended the harm to occur or not. Afterwards, children were asked to evaluate the speech act for its moral valence and to justify their evaluation. In Experiment 1 children evaluated the puppet’s factual claim more negatively when they anticipated harmful versus harmless consequences ($Z = -2.360$, $p = .018$, $r = .481$). In Experiment 2 children evaluated the puppet’s factual claim more negatively when the puppet’s intention was bad than when it was good ($Z = -2.00$, $p = .046$, $r = -.408$) over and above harmful consequences.

These findings suggest that preschoolers’ normative understanding is not limited to evaluating others’ intrinsically harmful transgressions, but also entails an appreciation of the morally relevant consequences of, and intentions underlying, others’ assertive speech acts.

Epistemic vigilance online: Children’s selective trust in websites

Shiri Einav, Alexandria Levey, Priya Patel, Abigail Westwood

University of Nottingham, UK

In this age of “fake news”, it is crucial that children are equipped with the skills to identify unreliable information online. However, little is known about early critical digital literacy. Our study is the first to examine whether children are influenced by the presence of errors contained in websites when deciding which sources to trust. Forty-eight 8-10 year-olds viewed three pairs of websites about child-friendly topics (e.g., the North Pole). For each pair, one website contained obvious errors (factual, typographical or exaggerations, according to condition) whereas the other did not. Importantly, the paired websites offered conflicting claims about two facts piloted to be unfamiliar to children of this age (e.g., thickness of ice in North Pole). Across a series of test trials, participants were asked questions pertaining to the novel facts to examine whether they systematically selected answers from the accurate websites. In a post-test phase, we also obtained justifications for responses and assessed children’s spontaneous and prompted awareness of the errors. We found that participants performed above chance only in the typographical errors condition. Moreover, their independent awareness of website inaccuracy was low when

the errors were content-based (i.e., factual or exaggerations). Our findings suggest that 8-10 year-olds are not influenced by the presence of content errors when deciding which websites to rely on for obtaining new information but they are sensitive to typographical errors. This study begins to highlight children's limitations in critically evaluating the quality of material online and indicates a potential focus for educational intervention.

Investigating children's developing understanding of integrity in others' epistemic practices

Lucas Payne Butler, Hailey M. Gibbs

University of Maryland, USA

In a society increasingly inundated with information, a pressing issue facing society is ensuring that as children develop the mental habits that will guide how they engage with the world, they learn to approach information with an evaluative lens. Fundamentally, this requires understanding and evaluating whether others' claims are made in an intellectually honest way.

This talk presents a framework for investigating children's developing ability to reason about whether others are engaging in epistemic practices with integrity, and initial results within this framework. Specifically, we propose three broad principles underlying integrity in epistemic practice: (1) Don't See Something? Don't Say Something. This is the principle that we ought to only make claims to knowledge that we actually have, and the corollary that if do not have the relevant knowledge to make a claim, we ought not to make it. (2) Be Honest About What You Expected to be True, and When You Are Wrong. This is the principle that, when our predictions are wrong, we should not claim that what is true is what we expected all along, or that we are right even despite evidence to the contrary. (3) Be Honest About What You Know and What You Don't. This is the principle that when evidence is inconclusive about a claim we want to make, we ought to be transparent and present all the evidence, even that which might conflict with our claim.

PAPER SESSION 6

PROSOCIALITY

Saturday, January 5th, 16:30-18:00

Chair:

Denis Tatone, Central European University, Hungary

Preschoolers expect prosocial actions from others who shared voluntarily (not involuntarily)

Julia P. Friedrich¹, Marco F.H. Schmidt^{1,2}

¹Ludwig-Maximilians-University Munich, Germany; ²University of Bremen, Germany

To navigate our complex social world, children must pay attention to the underlying intentions of individuals performing morally relevant actions (Killen et al., 2011). Children themselves tend to be more prosocial when they had voluntarily shared a resource with another individual than when they were instructed to share (Chernyak & Kushnir, 2013). But how do children form expectations about others' tendency to behave prosocially or selfishly? Here, we investigated preschoolers' descriptive third-party expectations about the causal agent of prosocial and selfish actions, based on agents' prior history of (in) voluntary prosocial behavior.

Four, 5-, and 6-year-olds (N=69) observed a voluntary prosocial agent (shared a sticker voluntarily) and an involuntary prosocial agent (was instructed to share by an authority). Subsequently children saw a prosocial (2 of 3 marbles were shared), and a selfish distribution (none of 3 marbles were shared). Children were asked to decide who of the agents had performed the allocation. Overall, 6-year-olds expected the voluntary prosocial agent to be more likely to have performed the prosocial, and the involuntary prosocial agent the selfish, distribution, $t(23)=1.99, p<.05$. In a post-test, 5- and 6-year-olds ($p's<.01$) identified the voluntary prosocial agent as the "good one".

Our findings suggest that by the age of 6, preschoolers use information about the circumstances and intentions of agents' prior prosocial actions to form descriptive, third-party expectations about their current morally relevant sharing behavior. From around 5 years of age, children differentiate in moral terms between an agent who shares resources voluntarily and an agent who shares involuntarily.

Common Knowledge Promotes Helping in Young Children

Barbora Siposova^{1,2}, Sebastian Grueneisen^{2,3}, Katharina Helming², Michael Tomasello^{2,4}, Malinda Carpenter^{1,2}

¹University of St Andrews, UK; ²Max Planck Institute for Evolutionary Anthropology, Germany; ³University of Michigan, US; ⁴Duke University, USA

Imagine a young man is sitting in a crowded bus and an elderly woman enters. He knows he should offer his seat but he would prefer to sit himself. However, once the woman says loudly, “I wish I could sit down,” he feels obligated to get up. It is now common knowledge between them that he knows about her need. This heightens the pressure on him to offer his seat because he cannot plausibly deny that he knew she needed it. Common knowledge—the ability to know something together with someone else—is a crucial feature of social cognition (Chwe, 2013; Pinker, 2007). Are children’s prosocial tendencies affected by having common knowledge? To test this, 6-year-old children (N=100) faced a dilemma in which they needed to choose between pursuing their self-interest (collecting stickers) or behaving prosocially (helping an experimenter (E)). We manipulated the type of knowledge (private vs. common) that children achieved about the fact that E needed their help. To examine the influence of the type of knowledge on children’s helping behavior, we used a survival analysis, which allows for the estimation of the probability of helping from two variables: whether and how quickly children helped. We found that the probability of helping in the common-knowledge condition was 111.5% higher than in the private-knowledge condition (Cox-proportional-hazards model, $p=0.026$). These results suggest that common knowledge can heighten the pressure to fulfill one’s obligations. Helping behavior can thus be promoted by generating common knowledge about the fact that help is needed.

SYMPOSIA AND
PAPER SESSIONS

Return the Favor: Preverbal Infants Represent Direct Reciprocity under Resource Scarcity

Lotte Thomsen^{1,2}, Joakim Zahl Haugane¹, Erik Kjos Fonn¹, Oda Eidar¹

¹Department of Psychology. University of Oslo, Norway; ²Department of Political Science, Aarhus University, Denmark

Theory posits that direct reciprocity may critically sustain the evolution of altruism and cooperation with non-kin (Trivers, 1971), suggesting that representations of reciprocity might evolve. Here, we familiarized 32 7-12 month-old infants to three novel agents who each approached one, two, or three apples, eating one to be left with zero, one or two

remaining apples, respectively. Next, the agent with two apples left (the benefactor) gave one of them to the agent with none (the beneficiary), so that all three agents again had one apple which they proceeded to eat. In test trials, the former beneficiary instead had two apples, while both other agents had none, making appealing sounds in chorus to receive one. In expected test trials the former beneficiary now moved over and gave one of its apples to its former benefactor; in unexpected test trials it gave it to the third agent, before returning to its original place. As predicted, we found a main effect of test type ($p=.016$) which interacted with participant age ($p=.006$) such that nine-to-twelve month-olds differentiated unexpected from expected trials ($M_{Unexpected}=27,8$ seconds; $M_{Expected}=21,5$; $p<.0005$), but that 7-8 month-olds did not ($M_{Unexpected}=25,0$; $M_{Expected}=25,67$, n.s.). A control study ($N=32$ 7-12 month-olds) simply removed the apples, but kept all agents, movements and sounds identical. Now infants did not differentiate unexpected ($M=25,8$) from expected trials ($M=25,2$, ns.) and we found no interaction with participant age.

Competition impedes cooperation in the stag hunt game

Keith Jensen¹, Liam Pollock²

¹University of Manchester, UK; ²Queen Mary University of London, UK

The stag hunt is a potential solution to the “cooperation problem”. Both partners should choose to work together for a larger mutually beneficial payoff (stag) rather than individually pursue a lesser one (hare). However, while children have been shown to solve this dilemma by playing mutualistically (Duguid et al., 2014), adults do not always succeed (Al-Ubaydli, Jones, & Weel, 2013). The stag hunt does not ensure cooperation.

To test the limits of cooperation in a weak dilemma, children, from 4 to 8, played repeated-rounds stag hunt games. In the first experiment, 118 children played a stag hunt game with their parents, with half informed of the game structure in advance and half discovering it through the course of play. Regardless of information, and despite the cooperative efforts of parents, children across all ages were predominantly non-cooperative. In the second experiment, when playing against peers (122 children, from 4 to 8 years of age) still chose hare surprisingly often. Age did not influence cooperativeness, although children were more cooperative when playing against siblings and friends rather than strangers.

Children appear to have been trying to “win” the stag hunt. Rather than maximise their personal payoff or achieve the best mutually beneficial outcome, they were playing for relative advantage over their partners. This irrational behaviour supports the notion that humans are “hyper-competitive”, that gains relative to others can interfere with cooperation.



PA - 001 The influence of others' contributions on the IKEA effect.

Lauren E. Marsh¹, Patricia Kanngiesser²

¹University of Nottingham, UK; ²Free University Berlin, Germany.

PA - 002 German-speaking preschoolers struggle with syntax – behavioral vs. eye tracking results

Nenad Jovanovic, Barbara Höhle

University of Potsdam, Germany

PA - 003 Preschoolers' social inclusion of outgroup members

Theo Toppe¹, Susanne Hardecker², Daniel B. M. Haun¹

¹Department of Early Child Development and Culture, Leipzig University & Leipzig Research Center for Early Child Development, Germany; ²Max Planck Institute for Evolutionary Anthropology, Leipzig, Germany

PA - 004 (Not all) Children Prefer to Collaborate – The Relation Between Social Motivation and Theory of Mind-development Across Cultures

Roman Stengelin^{1,2}, Robert Hepach^{1,3}, Daniel B.M. Haun^{1,2}

¹Leipzig Research Center for Early Child Development, Germany; ²Department of Early Child Development and Culture, Leipzig University, Germany; ³Department of Research Methods in Early Child Development, Leipzig University, Germany

PA - 005 Numerical and temporal judgments affected by cognitive load in distinct ways

Karina Hamamouche¹, Maura Keefe¹, Kerry Jordan², Sara Cordes¹

¹Boston College, USA; ²Utah State University, USA

PA - 006 Comprehension of weak and strong scalar implicatures in Japanese young children and adults

Tetsuya Yasuda¹, Harumi Kobayashi¹

¹Tokyo Denki University, Saitama, Japan

PA - 007 Physiological Arousal changes dynamically before infants show gaze following

Mitsuhiko Ishikawa¹, Shoji Itakura¹

¹Kyoto University, Kyoto, Japan

POSTER SESSION A
THURSDAY

PA - 008 Verb-body part associations in children as compared with intellectually disabled adults

Sigal Uziel-Karl

Achva Academic College, Israel

PA - 009 Speech processing and mental fatigue: auditory perception in reading impaired individuals as a function of time-on-task

Dan Cooper^{1,2}, Shimon Sapir¹, Donna Abecasis¹

¹University of Haifa; ²Tel Aviv University

PA - 010 The development of verbal rehearsal to support working memory: automatic maintenance mechanism or adaptively used strategies?

Sebastian Poloczek^{1,2}, Chris Jarrold¹

¹University of Bristol, UK; ²Goethe University, Frankfurt am Main, Germany

PA.e - 011 Japanese Monolingual and Bilingual Sentence Processing Strategies: How Argument-Omitted Sentences Affect Case-Maker Learning

Akiko Zhao Chou¹, Hiromu Sakai²

¹Hiroshima University, Japan; ²Waseda University, Japan

PA.e - 012 Interpretive Theory of Mind, Emotion Understanding and the Empathic Prosocial Moral Reasoning Orientation

Yifat Harari¹, Michael Weinstock²

David Yellin College, Jerusalem, Israel

PA - 013 What directives tell us about cognitive development in typologically different languages

Reili Argus¹, Sigal Uziel-Karl²

¹Tallinn University; ²Achva Academic College

PA - 015 Great apes' understanding of others' beliefs involving object tracking: two manual search tasks

Dora Kampis¹, Ildikó Király^{2,3}, György Gergely², Ágnes M. Kovács², Africa de las Heras⁴, Christopher Krupenye⁴, Josep Call⁴

¹University of Copenhagen, Copenhagen, Denmark; ²Central European University, Budapest, Hungary; ³ELTE, Budapest, Hungary; ⁴University of St Andrews, St Andrews, UK

PA - 016 Association of speech perception and production in 2-month-olds: Relating event-related brain potentials to vocal reactivity

Gesa Schaad^{1,2,3}, Angela D. Friederici², Hellmuth Obrig^{1,3}, and Claudia Männel^{1,2,3}

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PA.e - 020 Communicative Hand-Waving Gestures Facilitate Object Learning in infancy

Masahiro Hirai¹, Yasuhiro Kanakogi²

¹Jichi Medical University, Japan; ²Otemon Gakuin University, Japan

PA.e - 021 Top-down or bottom-up: explaining differences in sensory profiles in typical development

Elena Serena Piccardi¹, Mark Henry Johnson^{1,2}, Teodora Gliga^{1,3}

¹Centre for Brain and Cognitive Development, Birkbeck University of London, London, UK; ²Cambridge University, Department of Psychology, Cambridge, UK; ³East Anglia University, Department of Psychology, Norwich, UK

PA - 022 The kevtá is striped. On the role of linguistic form in concept acquisition

Kim Fuellenbach¹, Susan Gelman²

¹Oxford University, Oxford, UK; ²University of Michigan, Ann Arbor, USA

PA - 023 Modelling the Paradox of the False Belief Task with Mental Files

Julia Wolf

Ruhr University Bochum, Bochum, Germany

PA - 024 Mapping of novel words onto auditory referents in early infancy: an ERP study

Samuel H. Cospér¹, Claudia Männel^{2,3}, Jutta L. Mueller¹

¹Institute of Cognitive Science, Osnabrück University, Osnabrück, Germany; ²Clinic for Cognitive Neurology, Medical Faculty, University Leipzig, Leipzig, Germany; ³Departments of Neuropsychology and Neurology, Max Planck Institute for Human Cognitive and Brain Sciences, Leipzig, Germany

POSTER SESSION A
THURSDAY

PA.e - 025 Measuring executive functions in 1- to 4-year olds: a novel problem-solving task

Alexandra Hendry¹, alexandra.hendry@psy.ox.ac.uk, Mary Agyapong², Hana D'Souza³, Isabel Quiroz³, Matilda Frick⁴, Ana Maria Portugal³, Linn Andersson Konke⁴, Karin Brocki⁴, Rachael Bedford⁵, Tim Smith³, Annette Karmiloff-Smith³, LonDownS³, Emily Jones³, Tony Charman²

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PA.e - 026 12-month-old infants actively seek information from a knowledgeable social partner

Marina Bazhydai, Gert Westermann, Eugenio Parise
Lancaster University, Lancaster, UK

PA - 027 Two different systems for thinking about other people's thoughts in the developing brain

Charlotte Grosse Wiesmann^{1,2}, Angela D. Friederici¹, Nikolaus Steinbeis¹, Tania Singer¹

¹Max Planck Institute for Human Cognitive and Brain Sciences, Leipzig; ²Department of Psychology, University of Copenhagen

PA - 028 Infants benefit from auditory predictive coding: Perceptual anchoring as a stepping stone into language acquisition

Claudia Männel^{1,2,3}, Hellmuth Obrig^{1,2}, Arno Villringer^{1,2}, Merav Ahissar⁴, Gesa Schaadt^{1,2,3}

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PA - 029 Preschoolers Use the Gratitude of Newcomers as a Cue for Their Future Altruism

Joakim Haugane Zahl¹, Erik Kjos Fonn¹, Victoria de Born¹, Lotte Thomsen^{1,2}

¹University of Oslo, Norway; ²Aarhus University, Denmark

PA - 030 The development of working memory for action events

Angie Makri, Christopher Jarrold
University of Bristol, UK

PA - 031 Directive speech acts in Estonian child directed speech and their influence to children's vocabulary

Andra Kütt, Reili Argus
Tallinn University

PA - 032 What if everybody did that? Preschoolers know when Kant's categorical imperative makes an action morally wrong.

Sydney Levine^{1,2}, Max Kleiman-Weiner^{1,2}, Sol Fonseca³, Joshua Tenenbaum¹, Fiery Cushman², Laura Schulz¹

¹Massachusetts Institute of Technology, Department of Brain and Cognitive Sciences, Cambridge, MA, USA; ²Harvard University, Department of Psychology, Cambridge, MA, USA; ³University of Puerto Rico, San Juan, Puerto Rico, USA

PA - 033 A cross-linguistic Bayesian data analysis of number word learning

Francis Mollica¹, Steven Piantadosi²
¹University of Rochester; ²University of California, Berkeley

PA.e - 034 Exact Interpretations of Singular and Dual Forms in Slovenian preschoolers via implicature

Amanda Saksida¹, Dimitrios Skordos², Jess Sullivan³, Lanko Marušič⁴, Rok Žaucer⁴, David Barner⁵
¹Institute for Maternal and Child Health - IRCCS "Burlo Garofolo" - Trieste, Italy; ²University of Calgary, Calgary, Alberta, Canada; ³Skidmore College, Saratoga Springs, NY, USA; ⁴University of Nova Gorica, Nova Gorica, Slovenia; ⁵University of California San Diego, USA

PA.e - 035 The role of relative age in the diagnosis of ADHD

Shimi Gilad¹, Eran Sandel²
¹Jerusalem psycho-Educational services, Jerusalem Israel; ²Neurotech solutions

PA - 036 Seeing iconic gestures promotes second-order verb generalization in preschool-aged children.

Suzanne Aussems, Sotaro Kita
University of Warwick, Coventry, United Kingdom

PA - 037 Are emotions pedagogically transmitted?

Emiliano Loria
Consortium FINO, Genoa-Turin, Italy

POSTER SESSION A
THURSDAY

PA - 038 The relationship between understanding numerals and logical connectives: the case of 'and'. A study in 3-year-old children

Irene Canudas-Grabolosa¹, Elena Pagliarini¹ and Luca L. Bonatti^{1,2}

¹Universitat Pompeu Fabra, Center for Brain and Cognition, Ramon Trias Fargas, 25-27, 08005 Barcelona, Spain; ²ICREA, Pg. Lluís Companys 23, 08010 Barcelona, Spain.

PA - 039 Development of semantic control from 5-10 years

Josie Briscoe, Katrina Daw

School of Psychological Science, University of Bristol, Bristol, UK

PA - 040 "In MY Opinion": Children and adults' understanding of the origins and markers of subjective disagreement

Ruthe Foushee, Mahesh Srinivasan

University of California, Berkeley

PA - 041 Hippocampal maturation drives memory from generalization to specificity during childhood and adolescence

Attila Keresztes

Max Planck Institute for Human Development, Berlin, Germany

PA - 042 Reciprocity across distributive games

Martina Vogelsang, Wiebke Eden, Mirjam Ebersbach

Department of Psychology, University of Kassel, Kassel, Germany

PA - 043 Joint attention and mental state talk about desire in young children in Croatia

Marina Kotrla Topic

Institute of Social Sciences Ivo Pilar, Osijek, Croatia

PA - 044 Theory of Mind Interacts with Semantic Comprehension in 14-month-old Infants

Bálint Forgács^{1,2}, Judit Gervain³, Eugenio Parise⁴, Gergely Csibra⁵, György Gergely⁵, Júlia Baross¹, Ildikó Király¹

¹Eötvös Loránd University (ELTE), Budapest, Hungary; ²Hungarian Academy of Sciences, Budapest, Hungary; ³Université Paris Descartes, France; ⁴Lancaster University, United Kingdom; ⁵Central European University (CEU), Budapest, Hungary

PA.e - 045 Speaking in Two Tongues: Bilingualism & Metaphor

Lydia Burchett, Mélanie Gréaux, Nausicaa Pouscoulous

University College London, London, United Kingdom

PA - 046 Factors influencing behavioral consequences of spontaneous belief attribution in adults

David Buttelmann¹, Frances Buttelmann²

¹Department of Developmental Psychology, University of Bern, Switzerland; ²Department of Developmental Psychology, Friedrich-Schiller-University Jena, Germany

PA - 047 Does violation of expectation result in better learning? A replication of Stahl & Feingenson (2015)

Viktoria Csink¹, Denis Mareschal¹, Teodora Gliga^{1,2}

¹Birkbeck College, University of London, UK; ²University of East Anglia, UK

PA - 048 Bridging the Gap Between Past and Present: Narrative Nonfiction in the History Classroom

Emma Browning

King's College London, UK

PA - 049 Verbal performance limitation in the pragmatic skills of sign language users - A cognitive developmental perspective on atypical humor comprehension

Zsuzsanna Schnell¹, Tímea Budai²

¹University of Pécs, Department of Linguistics, Hungary; ²University of Pécs, Department of Psychology, Hungary

PA.e - 052 Children's Expectations for Selective Comforting Among Friends

Amanda Mae Woodward, Tara K. McCurry, & Jonathan S. Beier

University of Maryland, College Park, MD

POSTER SESSION A
THURSDAY

PA - 001 The influence of others' contributions on the IKEA effect.Lauren E. Marsh¹, Patricia Kanngiesser²¹University of Nottingham, UK; ²Free University Berlin, Germany.

Owning and creating objects can increase our evaluation of them, even in cases where we compare them to physically identical copies. These biases (known as the Endowment Effect and the IKEA Effect respectively) emerge at 4-to-5-years of age and may reflect a strengthening of self-object processing in this period of development. Previous studies have focused on the bias towards self-created objects but it is unclear whether children also consider others' contributions when evaluating their creations. In this paper I present two studies which evaluate the influence of other-ownership and collaboration on the IKEA effect. In the first study, 66 5-to-6-year old children assembled and evaluated a toy. Prior to assembly, they were told either 1) that they owned the pieces, 2) that another child owned the pieces, or 3) that another child had created the pieces. A diminished IKEA effect was found for those children who believed that another child created (but not owned) the pieces. The second study examined the impact of collaboration on the IKEA effect in two societies – the UK and India. 128 5-to-6-year old children assembled toys in pairs. Half of the children collaborated to assemble a single toy and half assembled their own toy. In both societies, children demonstrated an IKEA effect, valuing their own creation over an identical copy. This was the case regardless of whether children collaborated or worked independently. In summary, it seems that the IKEA effect is a potent bias which is insensitive to others' contributions in a collaborative environment.

PA - 002 German-speaking preschoolers struggle with syntax – behavioral vs. eye tracking results

Nenad Jovanovic, Barbara Höhle

University of Potsdam, Germany

Proper understanding of the passive voice is generally difficult for children up to the age of 5 or 6 (Armon-Lotem et al., 2016). There are three main theories which explain the cause of this delay. An experiment was devised using syntactic priming to elicit better comprehension of passives in German-acquiring children. The behavioral data in combination with the eye tracking results would show which of the three main theories best explains the likely cause of the delay, since each one had a different prediction for the outcome of the study. The children did not benefit from structural priming in the experiment and continued to give incorrect responses in the picture selection task. This outcome aligns with the predictions of the A-chain deficit hypothesis (Borer & Wexler, 1987). Children under a certain age do not possess the required cognitive capacities to properly understand the syntactic movement involved in the creation of a passive voice structure. For the eye tracking part of the experiment, only the correct answers of the children were analyzed. The items where they made errors were excluded. The children did not benefit from priming here either, but what is more important, their looks towards the correct image were delayed and not near ceiling, despite

them giving a correct answer. The children were not able to use abstract syntactic knowledge to properly understand passives. The adults in the control group did not exhibit such difficulties, and structural priming led to more looks towards the target for them.

PA - 003 Preschoolers' social inclusion of outgroup members

Theo Toppe¹, Susanne Hardecker², Daniel B. M. Haun¹

¹Department of Early Child Development and Culture, Leipzig University & Leipzig Research Center for Early Child Development, Germany; ²Max Planck Institute for Evolutionary Anthropology, Leipzig, Germany

This study examined the effect of outgroup membership on social inclusion behavior across preschool ages. Using a novel interactive real-world paradigm 3- to 5-year-old children (pre-registered N = 144) played a ball-tossing game with a puppet. Over the course of the game, a second puppet joined the interaction and children's social inclusion decisions were assessed. The joining puppet was either a neutral agent or an outgroup member of color preference groups. Preliminary results (N = 124) reveal that outgroup membership lowers children's willingness to include others as compared to neutral agents across all ages. Moreover, children marginally tend to be more inclusive with increasing age. The diversity in children's daily environment does not seem to impact their social inclusion decisions. Our findings suggest that outgroup membership of potential co-players lowers preschoolers' willingness to include these. Additionally, our novel paradigm allows insight into the development of children's actual inclusion behavior as compared to previous studies that mostly investigated hypothetical scenarios.

PA - 004 (Not all) Children Prefer to Collaborate – The Relation Between Social Motivation and Theory of Mind-development Across Cultures

Roman Stengelin^{1,2}, Robert Hepach^{1,3}, Daniel B.M. Haun^{1,2}

¹Leipzig Research Center for Early Child Development, Germany; ²Department of Early Child Development and Culture, Leipzig University, Germany; ³Department of Research Methods in Early Child Development, Leipzig University, Germany

Young children from urban, Western populations have been shown to seek and like engaging with peers in collaborative interactions. This social motivation has been suggested to increase the frequency and quality of social interactions and thereby contribute significantly to children's emerging understanding of others as mental agents. Whether and to what extent this social motivation results from culture-specific socialization remains unknown. We tested 3- to 8-year-old children (N = 240) from Germany and two rural Namibian cultures (Haillom, Ovambo) in a dyadic experimental setting. Over the course of the study, children could obtain rewards either alone or collaboratively with a peer. We investigated children's positive affect across collaborative, as compared to individual trials.

Additionally, in one trial, children had the chance to decide themselves whether to obtain a reward alone or together with a peer. Our data suggests systematic cross-cultural variability in children's social motivation. While German children showed the expected motivational bias toward collaboration in both affect displays and preferential choices, this pattern was less robust in Ovambo children and even reversed among Haillom children. Regardless of culture, social motivation related to children's Theory of Mind abilities, suggesting an important role of social motivation in the ontogeny of social cognition.

PA - 005 Numerical and temporal judgments affected by cognitive load in distinct ways

Karina Hamamouche¹, Maura Keefe¹, Kerry Jordan², Sara Cordes¹

¹Boston College, USA; ²Utah State University, USA

Despite much research suggesting that time and number are processed by a common magnitude system across development (e.g., Meck & Church, 1983; Walsh, 2003), a growing body of work casts doubt on the presence of a single system. Numerous inconsistencies between temporal and numerical processing have been identified. One such inconsistency is distinct temporal and numerical bias in the presence of emotional content (Baker, Rodzon, & Jordan, 2013; Young & Cordes, 2013); emotional stimuli lead to temporal overestimation, but numerical underestimation in adults. These findings have led researchers to speculate about potentially distinct cognitive mechanism(s) underlying these unique biases. Increased arousal brought on by emotional stimuli has been suggested to underlie temporal overestimation, whereas altered attention may lead to numerical underestimation. The current study tested adults' temporal and numerical processing under cognitive load, a task that compromises attention. Under a common magnitude system, cognitive load should identically impact temporal and numerical judgments. Inconsistent with the common magnitude account, results revealed not only that baseline performance on the temporal and numerical task was not correlated but also, cognitive load resulted in distinct and opposing quantity biases: numerical underestimation and marginal temporal overestimation. These data call into question the common magnitude account, while also providing support for the role of attentional processes involved in numerical underestimation.

PA - 006 Comprehension of weak and strong scalar implicatures in Japanese young children and adults

Tetsuya Yasuda¹, Harumi Kobayashi¹

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Scalar implicature is important to share information on quantity. Recent researches showed that 5-year-olds have difficulty in understanding scalar information such as Some, e.g. 'Some boys have

an umbrella' implies 'not all boys have an umbrella.' In Japanese, it is completely grammatical and natural to say a weak positive expression without using Some, i.e., 'Baggu wo motteiru hito ga imasu (There are persons with a bag.) This expression does not imply all persons have a bag, but only some persons have a bag. Likewise, it is possible to say a strong negative expression without using None, 'Baggu wo motteiru hito ga imasen (There are "not" persons with a bag.)' This expression implies 'None of the persons have a bag.)' We examined scalar implicature in positive / negative expressions using three situation cards (Some=2/6, All=6/6, None=0/6, e.g., "Some" card was consisted of 2 persons with a bag and 4 persons without a bag). In the experiment, 14 3-year-old, 16 5-year-old, and 23 adult monolingual speakers in Japanese participated. The participants were asked to choose a card which accords with a given expression. Results were that the adults interpreted the positive expressions as "Some" meaning, but the children interpreted the positive expressions as "All" meaning. As for negative expressions, the children interpreted "None" meaning similarly with adults. It is suggested that young children comprehend scalar expressions as strong-quantifiers regardless of positive or negative expressions even when keywords Some and None are missing.

PA - 007 Physiological Arousal changes dynamically before infants show gaze following

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According to the Natural Pedagogy theory, eye contact is one of the most important communicative cues and promotes infant gaze following. There are many suggestions how eye contact affects infant and why eye contact induce gaze following behavior. Here, we measured the heart rate variability during infants making eye contact with others, and whether the heart rate variability predicts gaze following behavior or not. Twenty-five infants between 9 to 10-month olds participated in this study. Participants watched video presentation of an actor gazing toward one of two objects after eye contact or without communicative intent. There were 3 conditions, eye contact, no eye contact and shivering condition. Also, the videos were consisted of 3 phases, baseline, target phase and gazing phase. We measured heart rate during watching video, and infants' gaze following behaviour was recorded with eyetracking techniques.

As a result, infants showed gaze following only in the eye contact condition above the chance level (50%). Also, compared with the baseline, heart rate was accelerated during infant making eye contact. Also, we conducted GLM to examine whether heart rate variability predicts gaze following or not. We found that higher heart rate in the target phase predicts gaze following behavior in the gazing phase. From these results, it can be considered that eye contact may increase infant heart rate quickly, and such physiological changes would be highly related with gaze following behavior. Physiological arousal may be changed dynamically before infants follow other's gaze direction.

PA - 008 Verb-body part associations in children as compared with intellectually disabled adults

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The Embodiment Hypothesis contends that the body forms a link between the world and the mind (Wilson Wilson & Foglia, 2002). Recent work on neurocognition, language use and language acquisition suggests that using knowledge of the physical world to construct linguistic knowledge is particularly relevant to verbs. Moreover, previous studies on verb – body-part associations report a tendency to systematically link verbs to body areas. The present study examines verb – body-part associations in 150 Hebrew speaking children ages 4;0, 5;0 and 6;0 and compares them to findings from 26 Hebrew-speaking adults with mild intellectual disability (ID), aged 23-65. Both populations were asked to freely associate body-parts with 20 most frequently used verbs in the input to children. The following findings emerged: With age, the children increase the overall number of body parts and the level of detail of body-parts linked with particular verbs (hand vs. finger); In contrast, individuals with ID provide a more limited selection of body parts with less detail; more concrete responses relating to the place where the action was performed (sleep in bed) or the objects used to perform it: more associative responses (jumping - doing sports), inappropriate body parts (taking a stomach, standing belly), and “do not know” responses. The discussion focuses on the extent to which the findings reflect the cognitive abilities of each population and its understanding of the self and the body, and the importance of body part knowledge to the acquisition of verb meaning.

PA - 009 Speech processing and mental fatigue: auditory perception in reading impaired individuals as a function of time-on-task

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Introduction: Findings from recent decades suggest that impaired speech processing may account for the reading impairments in developmental dyslexia (DD), with evidence of a difficulty in processing slow-rate rhythmic modulations such as those within the speech signal. Previous studies indicate that young dyslexics are prone to mental fatigue, possibly reflecting an attempt to compensate for their processing difficulties by increasing cognitive recruitment from other functions. The aim of our study is to explore the effects of an auditory signal detection as a function of time-on-task on a population with a presumed mild difficulty in auditory discrimination.

Method: 9 dyslexic (DD) and 9 typical readers (TR), all young adults with no background illnesses, were compared in an hour long signal detection task, identifying changes in rate for an auditory stimulus resembling a rhythmic transition between vowels.

Results: DD subjects demonstrated poor sensitivity to modulations which aggravates with time-on-task. In contrast, TR subjects improved their performance with each test block.

Discussion: Time-on-task analysis indicate that while TR were able to develop a learning curve for the auditory processing skill, DD subjects applied ineffective mechanisms, demanding increased cognitive resources - resulting in mental fatigue. Our findings underpin the importance of time-on-task measures in the cognitive sciences, as well as the effects of speech processing under difficult conditions on the the division of mental resources. These findings may carry significant implications for populations with impaired or deteriorating auditory perception, such as individuals with language or reading impairments, attention disorders, elderly citizens and more.

PA - 010 The development of verbal rehearsal to support working memory: automatic maintenance mechanism or adaptively used strategies?

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Verbal rehearsal is a key feature of certain working memory models with the assumption that children develop adult-like rehearsal around the age of 7. However, methods used for studying rehearsal have been criticised. The present study of 144 children combined methods that are rarely used to study rehearsal in serial recall. Self-paced presentation times were obtained throughout the experiment as a behavioural indicator of strategy use, as cumulative rehearsal should produce presentation times increasing with serial position. On half of the trials, children additionally were asked to indicate their behaviour immediately after each trial on a picture-supported response display. For 6- and 7-year-olds listening (without rehearsal) was the most common, but not the only strategy. Older children, were more likely to report using cumulative rehearsal, but less likely to report no rehearsal. Additionally, cross-classified mixed effects models revealed that older children were more likely to adjust their behaviour to the task difficulty, with more cumulative rehearsal and less single rehearsal or listening on harder trials. Importantly, these results based on self-reports were corroborated by the patterns of self-paced presentation times. It is concluded that development does not follow a stage-like development of a generic maintenance mechanism. Rather, the data support the overlapping waves model as several forms of verbal rehearsal coexist. In addition, the likelihood of using a strategy changes gradually, with further developmental changes between groups of 8-/9-year-olds and 10-/11-year-olds reflecting more adaptive strategy choices of the older children.

PA.e - 011 Japanese Monolingual and Bilingual Sentence Processing Strategies: How Argument-Omitted Sentences Affect Case-Maker Learning

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Children tend to comprehend first noun in the sentence as subject (Rowland & Noble, 2012). However, in Japanese, this is not the case. Since it allows argument omission, the first noun can occasionally

be an object. This study investigates (1) if Japanese monolingual and bilingual children comprehend the first noun in the Noun-Verb sentence (argument-omitted sentence without case marker) as an object, and (2) if Noun-ACC-Verb sentences (argument-omitted sentence with case-marker) are more effective than Noun-NOM-Noun-ACC-Verb sentences (full-argument sentence with case-marker) for both monolinguals and bilinguals to learn case-markers. We examined how monolinguals (study 1) and bilinguals (study 2) comprehend argument-omitted sentences, which has no case-markers. To investigate how 4 to 7-year-old monolinguals (study 3) and 4 to 9-year-old bilinguals (study 4) utilize argument-omitted sentences, we taught artificial case-markers to compare the effectiveness of argument-omitted sentences and full-argument sentences. Results from study 1 and 2 showed that monolinguals could comprehend the first noun in argument-omitted sentences as objects. However, bilinguals tend to comprehend the first noun in argument-omitted sentences as subjects. In addition, results from study 3 and 4 showed that argument-dropped exposure was more useful than full-argument exposure in learning object case-markers for both monolinguals and bilinguals. These results suggest that simpler sentences such as argument-omitted sentences may work better for both monolingual and bilinguals case-markers learning, specifically for the languages with high percentages of argument omission. Moreover, although bilinguals tend to comprehend first nouns in argument-omitted sentences as subjects, they could utilize argument-omitted sentences to learn case-markers.

PA.e - 012 Interpretive Theory of Mind, Emotion Understanding and the Empathic Prosocial Moral Reasoning Orientation

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Attainment of theory of mind (ToM) is considered a basis for a prosocial orientation (Lane et al., 2010). Recognizing that someone might legitimately hold false beliefs is said to indicate a child's awareness of the subjective nature of knowing. However, Lalonde and Chandler (2002) argue that the false-beliefs task, in which a child might recognize that someone having incorrect information will hold a false belief, does not require understanding subjective processes of knowing. A meaningful test of subjectivity in knowing is whether a child understands that two people with the same information can hold different beliefs because they interpret the information differently. Empathy, which involves taking another's perspective, might require the subjectivist perspective represented by this interpretive theory of mind. The research presented in this proposal tested the hypothesis that interpretive theory of mind (iToM) would predict the stage of empathic orientation (Eisenberg, 1982). 225 schoolchildren (ages 7.5-10.8, 53% girls) were assessed for ToM and iToM (with ambiguous pictures: Lalonde & Chandler, 2002), emotion understanding (through identifying emotions in social contexts: Schultz et al., 2004) and prosocial moral reasoning (with dilemmas: Eisenberg, 1982). iToM and emotion understanding mediated the relationship between age and the empathic orientation, and just iToM predicted the further development of the internalized values orientation. Simple ToM

was not found to predict the empathic or internalized values orientation. The study confirms the hypothesis that iToM, but not ToM, is a basis for the empathic orientation, and that iToM explains the development of empathic reasoning with age.

PA - 013 What directives tell us about cognitive development in typologically different languages

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Directives are speech acts that attempt to get the hearer to perform some action. The two main types of directives are orders (commands) and requests. Orders involve telling someone what to do, whereas requests involve asking someone to do something, with an option for the addressee not to comply (Aikhenvald 2016: 147). Cognitively, directives require awareness to the self and others; Structurally, they may be formed by inflection, modal verbs and designated sentence types; Pragmatically, being direct, orders are assumed to be simpler to understand and to produce than requests. The present paper compares the early use of directives in two typologically and culturally different languages, Estonian and Hebrew, using data from two Estonian-speaking children, aged 1;3 – 3;0 and two Hebrew-speaking children, aged 1;5–3;0, audio-recorded in interaction with their parents. Both child and parental data were analyzed. The findings reveal a continuous order of emergence of linguistic means for expressing directives. Children start with directives where the source of modality is within the speaker (e.g. orders) and continue with directives whose source of modality is external to the speaker (e.g., requests, statements of desired actions by quoting social norms). In both languages children first use verb inflection and later modal verbs. Finally, the impact of child-directed speech is reflected in the order of appearance of the first indirect requests in the children's speech. The findings point to similarities in the two groups of children's basic cognitive resources as they govern the development of communication skills.

PA - 015 Great apes' understanding of others' beliefs involving object tracking: two manual search tasks

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In humans, the ability to encode others' mental states (Theory of Mind, ToM) appears to emerge ontogenetically early. Recently in an eye-tracking paradigm Krupenye et al. (2017) provided the first evidence that similarly to human infants, non-human great apes anticipate other's actions based on their respective beliefs. However, humans can be argued to have significantly better socio cognitive

skills (Herrmann et al., 2007); thus it is unclear which ToM-related cognitive phenomena observed in humans may be shared by non-human primates.

In two experiments we tested apes' ToM abilities with an active behavioral measure. The tasks were adapted from a manual search paradigm previously used to assess object-tracking in human infants (Van de Walle et al., 2000) and non-human apes (Mendes et al., 2008).

Experiment 1 assessed whether non-human great apes' behavior would be spontaneously modulated by others' beliefs (a phenomenon termed altercentric modulation, which has been demonstrated in e.g. 14-month-old human infants; Kamps & Kovács, submitted). We included 'individuation' trials to test apes' ability to track objects from their own perspective, and 'belief' trials to see whether they are sensitive to another person's belief about a situation. While we replicated findings demonstrating apes' relatively sophisticated object-tracking abilities, their behavior did not show altercentric modulation. Experiment 2 tested whether apes could infer a person's actions based on her beliefs, and incorporate this into their own action planning (whether to search for a potential target). In general, apes were more successful on this task, and between-species differences will be discussed in our talk.

PA - 016 Association of speech perception and production in 2-month-olds: Relating event-related brain potentials to vocal reactivity

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Perceptual and expressive phonological abilities are key features for successful language development and a functional connection between speech perception and production has been postulated. Accordingly, it has been shown that babbling – a form of vocalization – shapes speech processing in 10-month-olds. Precursors of babbling (e.g., vocalization) already develop around the second month of life, but the association of speech perception and production (i.e., vocalization) has not been investigated during this early developmental period.

In the present event-related brain potential study, we investigated speech perception and production in 2-month-olds. For perception, the Mismatch Response (MMR) was measured in a multi-feature paradigm with four deviant categories (i.e., consonant, vowel, pitch, vowel length). For production, we used the subscale vocal reactivity (i.e., infants' amount of vocalization exhibited in daily activities) of the parental Infant Behavior Questionnaire.

Our data reveal positive MMRs for all deviant categories, typically observed in 2-month-olds. Importantly, we found a negative correlation between the MMR to vowel changes and vocal reactivity, but no such correlation for the other deviant categories. Thus, a more negative MMR to vowel changes was associated with infants' higher amount of vocalization, indicating that speech perception and production mutually interact already at an early age. Furthermore, the transition from a positive to a negative MMR polarity, with negative MMRs indicating more mature responses, might be influenced

by infants' expressive abilities. The observation of an effect for vowel changes may pertain to the earlier development of vowel, compared to consonant perception and production.

PA.e - 020 Communicative Hand-Waving Gestures Facilitate Object Learning in infancy

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Infants learn broad knowledge via social interaction with others. According to the natural pedagogy theory, human infants possess a fundamental capacity to detect ostensive cues from multimodal channels, such as gaze direction, infant-directed speech, and contingency, to acquire generic knowledge from others. Research examining these cues has ignored the ways in which infants use bodily cues from others during social learning in early infancy. This study sought to determine whether 4-month-old human infants exhibited a preference for horizontal or vertical (control) hand-waving gestures. We also examined whether horizontal hand-waving gestures followed by pointing facilitated the process of object learning in 9-month-old infants. The results showed that 4-month-old infants preferred horizontal hand-waving gestures over vertical hand-waving gestures, and this preference was observed even when featural and contextual information was removed. Further, the horizontal handwaving gesture induced identity encoding for cued objects, but the vertical gestures did not. As hand-waving gestures elicited visual preference and enhanced social learning in a similar manner to other ostensive signals, hand gestures could serve as a new type of ostensive signal. The current findings highlight the role of communicative intent embedded in bodily movements, which elucidate its impact on social learning in early infancy.

POSTER SESSION A
THURSDAY

PA.e - 021 Top-down or bottom-up: explaining differences in sensory profiles in typical development

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Background: Evidence from infant looking time studies indicates that information encoding occurring during phases of endogenous sustained attention supports learning and memory and affects performance in habituation paradigms.

Objectives: An issue still to explore concerns the role of learning and memory in biasing online selection of information and determination of perceptual priority in habituation designs.

Design: An EEG/ERP habituation design was employed to investigate the role of learning and memory in biasing online selection of information in 10-month-old infants. 128 black-and-white checkerboards

were randomly flashed on top of a cartoon scene repeated 12 times.

Methods: Continuous EEG was recorded and two indices extracted: P1 peak amplitude time-locked to checkerboard presentation; pre-stimulus theta-band oscillations time-locked to scene presentation. Results: Analysis of post-stimulus P1 and pre-stimulus theta revealed a non-linear modulation due to scene repetition. A decrease in P1 amplitude occurred during the first half of the session ($p < .001$). Contrarily, an increase in P1 amplitude occurred during the second half of the session ($p < .001$). Theta oscillatory power increased during the first half of the session ($p < .05$) This was followed by a decrease during the second half of the session ($p < .001$). The two measures were negatively correlated ($p = .001$). Conclusions: A key function of information encoding during endogenous sustained attention is that of supporting learning and memory. Documenting a non-linear profile of neural activity modulation due to scene repetition, this research expands on looking time studies and points to a role of learning and memory in biasing online selection of information and determination of perceptual priority in habituation paradigms.

PA - 022 The kevtas are striped. On the role of linguistic form in concept acquisition

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This research explores the role of linguistic form in concept acquisition, and specifically how generic subjects interact with properties that have a statistical (Barns are red) or principled (Robins are red) connection to the kind (Prasada & Dillingham, 2006, 2009).

In a match-to-sample task (based on Hollander et al., 2009), adult participants (N=426) were shown a picture of a new animal, learned a property about it (e.g., Kevtas wear scarves), and then identified another instance of the same kind. One option displayed similar shape but lacked the target's property, the other was dissimilar but possessed the property. The between-participants design crossed property type (principled/statistical) x generic language (bare plural, indefinite singular, definite singular, this-demonstrative [control]). Based on the linguistics literature, we predicted strong generalizations for principally connected properties for the three generic subjects. Further, we expected property to be chosen over shape when the indefinite singular (A kevtas...) introduced principled connections, and shape over property for statistical properties, especially for the definite singular (The kevtas...). We found a main effect of connection type (property chosen more for principled connections) but no difference within the three generic subject types (all of which differed from the control), in contrast to prior linguistic arguments and some experimental work. Despite its rare usage, the definite singular (The triangle is threesided) was typically interpreted generically, like the bare plural. To address a gap in the literature and understand the acquisition of generic interpretations for the, we are conducting a child-study comparing the this- and the-conditions.

PA - 023 Modelling the Paradox of the False Belief Task with Mental Files

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It is a well replicated finding that children as young as 15 months are able to pass the implicit false belief tasks (Scott & Baillargeon, 2017). Nonetheless, linguistically quite well developed children still fail the explicit false belief task till they are approximately 4 years old (Wellman, Cross, & Watson, 2001). This generates the so called paradox of the false belief task. Previous explanations of this paradox have tended to focus either on cognitive development (e.g. Apperly & Butterfill, 2009; Baillargeon et al. 2010), or situational factors such as children's linguistic understanding and the pragmatic challenges posed by the false belief task (e.g. Westra, 2016). We suggest a new account of this paradox in terms of an interplay between both cognitive and situational factors: making use of the Mental Files framework, recently put forward by Perner and Leahy (2016), we develop a more detailed account of cognitive development and argue that we need to consider the role of situational factors and how these relate to cognitive development in order to fully explain the paradox of the false belief task. In particular, we argue for the importance of situational factors which highlight the perspective of another person. Moreover, making use of the findings from the active helping behaviour paradigm (Buttelmann et al. 2009), we argue that situational factors play an important role in the development of cognitive abilities themselves, namely by providing the origin of perspectival thinking and thereby generating the need to relate different perspectives to reality for action.

POSTER SESSION A
THURSDAY**PA - 024 Mapping of novel words onto auditory referents in early infancy: an ERP study**Samuel H. Cospers¹, Claudia Männel^{2,3}, Jutta L. Mueller¹

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Although our daily experience is filled with input from multiple modalities, research on word learning has a strong focus on the audio-visual modality. Much is known about learning meaning relating to visual referents; however, considering that the auditory channel has been proven to be dominant at an early age, attention to auditory referents may be at least as strong as to that of visual referents in early infancy. How do infants learn words for things they cannot see? We address this gap by an event-related potential (ERP) experiment during which we presented 10- to 12-month-old infants with environmental sounds and spoken pseudowords sequentially in an associative-learning paradigm. In the learning phase, participants were presented with the sounds and words paired either in a consistent manner, where associative learning can occur, or in an inconsistent manner. The consistent auditory object-word pairs were presented in a subsequent testing phase either in matching or nonmatching conditions. ERPs from infants (N=32) show effects for both familiarization of word

forms as well as an established association between referent and word in the learning phase. In the testing phase, an N400-like component for non-matching versus matching words was found. These findings suggest that infants are able to map novel labels onto auditory referents; thus indicating infants are able to acquire novel word meaning irrespective of referent modality.

PA.e - 025 Measuring executive functions in 1- to 4-year olds: a novel problem-solving task

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Executive Functions (EFs) underpin the ability to work towards goals by co-ordinating thought and action. Research into the etiology and remediation of EF difficulties has been hampered by a scarcity of measures suitable for children under 4 years. In particular, there is a need for tasks which require EFs to be used in an integrated manner, and which examine what children do whilst problem solving. We introduce a novel problem-solving task involving a box with 3 rewards (sweets) visible in separate compartments. To retrieve all 3 rewards, participants must generate multiple strategies (pulling, lifting, etc.), inhibit previously-successful strategies, and persist in the face of set-backs. 117 typically-developing British and Swedish 1- to 4-year-olds attempted this 5-minute task.

Task success was positively associated with age ($r_s=.408$, $p<.001$), with significant differences found between 2- ($n=37$) and 3-year-olds ($n=32$) ($U=348.00$, $z=-2.954$, $p=.003$). Age effects were also found for generativity ($X^2(3)=7.958$, $p=.047$), with 3- and 4-year-olds generating more solutions than 1- and 2-year-olds. Significant age effects were not observed for perseveration ($X^2(3)=0.641$, $p=.887$) and age effects for persistence did not reach significance ($X^2(3)=7.168$, $p=.067$). Exploratory analyses indicate that individual differences may mask age-related differences in perseveration, with 9% of children spending 75-100% of their manipulation effort on 1 strategy.

This study indicates that conventional pass-fail measures under-estimate EF abilities in young children, and that when motivated most toddlers are capable of cognitive flexibility. The low social and language demands of the task may be useful in assessing EF in children with social-communication difficulties.

PA.e - 026 12-month-old infants actively seek information from a knowledgeable social partner

Marina Bazhydai, Gert Westermann, Eugenio Parise
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Infants' active social communication serves an interrogative function (Southgate, Van Maanen, & Csibra, 2007). Studies showed that infants expect to learn from previously reliable social partners (Begus & Southgate, 2012; Goupil, Romand- Monnier, & Kouider, 2016; Tummeltshammer, Wu, Sobel, & Kirkham, 2014). The present study investigated whether 12-month-olds reliably identify and selectively seek information from more knowledgeable adults when in need of relevant information. We measured social referencing as a behavioural correlate of epistemic, information-seeking process. In a live, head-mounted eye-tracking laboratory experiment, infants were introduced to two unfamiliar adults, an Informant (reliably labeling novel toys) and a Non-Informant (providing an equal amount of social engagement, but ignorant about object labels). At test, the caregiver placed two novel objects out of infants' reach and asked to locate a novel referent among them. Infants were significantly more likely to turn to the Informant than the Non Informant ($t(29) = 3.34, p = .002$, Cohen's $d = .73$; one-sample t-test, Bayes Factor Analyses yielded strong support for the alternative hypothesis, $BF_{10} = 24.5$). In addition, infants looked equally more often at either the Informant or the Caregiver than at the Non-Informant, and following the initial look, increased looking at the Informant while reduced looking at the Caregiver. These results highlight the active interrogative role of social referencing emerging prior to the mastery of pointing as part of the preverbal communicative toolkit.

POSTER SESSION A
THURSDAY

PA - 027 Two different systems for thinking about other people's thoughts in the developing brain

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While decades of research assumed that Theory of Mind (ToM) emerges around the age of 4 years, when children start passing traditional explicit ToM tasks, novel paradigms referred to as implicit ToM tasks have shown that infants younger than 2 years of age already have correct expectations on how others will act based on their beliefs. These findings have triggered highly controversial debates on the nature and development of ToM: How do infants solve the implicit ToM tasks? And do these tasks measure the same ToM abilities than the traditional explicit ToM tasks that are only passed several years later?

Here, we related gray matter (GM) maturation assessed with magnetic resonance imaging in 38 children aged 3- and 4-years with their ToM performance in implicit and explicit ToM tasks. While explicit ToM reasoning was associated with GM maturation in regions classically involved in ToM reasoning in adults (i.e., the precuneus and temporoparietal junction), the implicit ToM task was related with the

maturation of a distinct region in the supramarginal gyrus, also involved in visual perspective taking. Taken together, these results suggest that passing the explicit ToM tasks around the age of 4 years is related to mature adult-like mental state reasoning, whereas implicit ToM tasks rely on a different and earlier-developing process that might also support visual perspective taking.

PA - 028 Infants benefit from auditory predictive coding: Perceptual anchoring as a stepping stone into language acquisition

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Listeners predict upcoming events through experience. Predictive coding is functional in infants and adults, as evidenced by prediction errors in the event-related brain potential (ERP). Adults also show behavioral advantages in frequency discrimination in the context of repeated reference tones, serving as anchors for subsequent sounds. However, this immediate benefit of predictive coding for the processing of new information has not yet been tested for infants.

Here, we aimed to test the effect of context-based predictions from reference stimuli (i.e., perceptual anchoring) in infancy and evaluate its role in language acquisition. Employing ERPs, we presented 2-month-olds with tone pairs and 6-month-olds with syllable pairs across anchor (i.e. constant first stimulus) and no-anchor conditions (i.e. variable first stimulus). This experimental design allowed for comparing responses to identical second stimuli preceded either by constant anchor or random (no-anchor) first stimuli.

For 2-month-olds, ERP responses to the second tones revealed a modulation of infants' obligatory ERP components, with more positive-going fronto-central responses in the anchor than the no-anchor condition. This effect resembled the adult P2 that is modulated by selective attention and training, resulting in faster auditory discrimination. For 6-month-olds, preliminary ERP responses to the second syllables suggest similar effects as in the tone experiment. Thus, infants process physically identical stimuli differently depending on the given stimulus environment. In sum, our study demonstrates for the first time that infants do not only apply predictive coding mechanisms, but show processing benefits from repeated information in their learning environment, with potential implications for language acquisition.

PA - 029 Preschoolers Use the Gratitude of Newcomers as a Cue for Their Future Altruism

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A critical problem for the evolution of altruism towards non-kin is how to recognize cooperators to direct altruistic help towards them, rather than to freeriders. Here we show that Norwegian preschoolers use peer gratitude as a cue for future altruism and modify their altruistic intentions accordingly. Using a computer-animated touchscreen scenario, we asked 3-6 year-olds to imagine they gave a drawing to two new children starting in their daycare. One beneficiary “was very happy for the drawing and said thank you” and one was not. Study 1 demonstrated that preschoolers expected grateful rather than ungrateful children to share scarce resources (Kool-Aid and candy) and information (an important secret) and also extend help (finding a lost shoe) and affiliation (joining you when you are playing alone) to them. Study 2 demonstrated that preschoolers themselves intend to act in such altruistic ways towards grateful rather than ungrateful peers; Study 3 that preschoolers generalize a beneficiary’s gratefulness towards themselves to predict her future altruism towards others; Study 4 that the effect of gratefulness is significantly stronger for predicting whether a beneficiary will perform altruistic acts rather than other positive, normative actions (i.e. waiting your turn); and Study 5 that preschoolers use genuine gratefulness, but not mom-solicited thankfulness, to predict future altruism. Finally, Study 6 tested the hypothesis that preschoolers themselves intend to act altruistically towards peers who were grateful to others because they infer that such grateful peers would likely act altruistically towards the participants themselves (mediating the effect).

POSTER SESSION A
THURSDAY

PA - 030 The development of working memory for action events

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Enacting (physically performing) action-object phrases has been found to lead to superior working memory performance compared to verbal recall in children and adults (Allen & Waterman, 2014; Waterman et al., 2017). The current study examined separately memory for actions and objects using novel action-object phrases under enactment or verbal recall. Twenty-four children and forty adults took part in the study. Participants listened to sets of novel action-object pairs and they were asked to recall either the actions or the objects presented, verbally or through enactment. The findings for both age groups suggest that enactment did not lead to superior performance compared to verbal recall. It is suggested that enactment benefits rely on rich action-motor plans formed during encoding (Koriat, Ben-Zur & Nussbaum, 1990; Allen & Waterman, 2014), and the selective retrieval of either the objects or the actions, hinders these enactment benefits in both children and adults. These findings contribute to the understanding of the enactment effect and shed light into its underlying causes. The observation that both children and adults suffered from selective recall further suggests that the mechanisms underlying enactment remain relatively stable across development.

PA - 031 Directive speech acts in Estonian child directed speech and their influence to children's vocabulary

Andra Kütt, Reili Argus

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Directives cover speech acts with different pragmatic force and cognitive complexity (Tomasello 2010: 84; Mauri, Sanso 2011: 3). The amount of directives in child directed speech has been considered to have a negative impact to children's speech development (Paavola-Ruotsalainen et al. 2017) and it has also been considered to serve as a predicting factor for child's academic success (Masur, Turner 2001). Not much attention has been paid to the question how can the amount of directives and their cognitive complexity affect the child's language development. The correlations between socioeconomic factors like mothers' education, cognitive complexity of directives they use, with child's language development have been almost uncovered area in first language study.

The current preliminary research bases on recordings of spontaneous speech of six 6-year old children with their mothers (9 hours). All directive speech acts were coded according to their cognitive complexity (e. g. commands, requests where the addressee is not expressed, e.g. wishes, and the most complex requests as social norms where neither addressee nor the speaker is not explicitly expressed).

Results revealed to the significant correlation between SES factors (e. g. mother's education), the amount and the types of directives used by mother, and child's language development. The speech of the mothers with higher education included a little bit less directives and they used more cognitively complex directives. Their children had significantly better vocabulary than other children. Thus, the child's vocabulary is influenced not only by the general amount of directives, but also by their cognitive complexity.

POSTER SESSION A
THURSDAY

PA - 032 What if everybody did that? Preschoolers know when Kant's categorical imperative makes an action morally wrong.

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Some things are harmless when one person does them, but harmful in aggregate. Kant proposed these are wrong because they violate a categorical imperative; put simply, he asked, "What if everybody did that?"

Do young children spontaneously employ the same logic to identify moral violations? We identify three "application conditions" (ACs) of the categorical imperative that would make an action wrong via this logic:

- 1) the action causes harm if many people do it
- 2) unless prohibited, many people might do it
- 3) the person doing it has no special privilege

Study 1: 9-year-olds (n=61) and adults (n=40) are significantly more likely to judge stories with all ACs to be morally wrong than stories missing an AC (pairwise t tests, 2-sided, $p < .05$). Preschoolers (n=46) follow a similar pattern, except that they are not sensitive to the “special status” AC.

Study 1a (n=360): when all ACs were present, adults were significantly more likely to say that “what if everybody did that” was a convincing argument for why the action was morally wrong than if any of the ACs was absent (pairwise t tests, 2-sided, $p < .05$).

Study 2 (n=101): adults read new stories and indicated the best explanation for why an action was wrong. Subjects converged on a best explanation for each story at above chance level ($p < .05$). This suggests that subjects selectively apply moral rather than indiscriminately applying any moral reason to any morally wrong action.

In sum, subjects spontaneously judge actions morally wrong that have bad effects in aggregate when the application conditions of the categorical imperative are present.

PA - 033 A cross-linguistic Bayesian data analysis of number word learning

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Children’s acquisition of number words follows a distinct developmental trajectory (Wynn, 1992). While this “knower level” pattern of behavior is robust across multiple languages and cultures (Sarnecka et al., 2007), the timing of the trajectory varies. Previous research has explained differences in timing in terms of language specific differences (Almoammer et al., 2013) or differences in education and cultural utility (Piantadosi, 2014). Here, we aim to provide convergent evidence for these observations and new insights using a large-scale, cross-linguistic Bayesian data analysis. Despite differences in data availability, education and cultural utility, do children across cultures/languages have the same inductive biases and profile of data usage when learning number word meanings? Using recent models for linking data usage to acquisition distributions (Mollica & Piantadosi, 2017; Hidaka, 2013), we expand an ideal number word learning model to infer the rate in which children use data and the inductive biases children bring to the task of number word learning. We compiled data from the Give-N task (Wynn, 1990) from seven different cultures/languages (English: n=311, Japanese: n=152, Mandarin: n=79, Russian: n=59, Saudi Arabic: n=83, Slovenian: n=341, and Tsimane: n=493). We find that the data is well explained by our model as compared to a baseline multinomial model. While there are minor differences in the inferred rate of data usage (~2-5 months/effective learning instance), our parameter estimates for inductive biases pattern similar and on the same order of magnitude across languages/cultures, suggesting universal inductive biases for number learning.

PA.e - 034 Exact Interpretations of Singular and Dual Forms in Slovenian preschoolers via implicature

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We explore the origin of the exact cardinal meanings represented by numerals like one and two. By some accounts, number words are lexically exact and acquired from exact logical meanings. Since very young children don't typically compute implicatures for other quantificational expressions, it has been argued that implicatures as a learning mechanism are not available in early childhood. Others, however, argue that number words are not lexically exact, but get their exact interpretation via pragmatic exhaustification (scalar implicature). For quantifiers (a/some), such exhaustification may be more difficult in early childhood because the relevant alternatives are not easily identifiable. To explore this idea, we tested a case that closely resembles that of number words, but is typically thought to involve implicature in adults. Specifically, we tested young children's interpretation of singular, plural, and dual morphology in Central Slovenian, and whether the presence of the dual allows children to derive exact interpretations via implicature.

In Exp.1, we found that older children (4–6-years-olds) computed implicatures robustly, with "exact" interpretations of singular, dual, and plural forms; there was no significant difference between morphology (Sg/Du) and number words (one/two). This contrasts starkly with past reports of English-speaking children on similar tests of singular/plural interpretation. In Exp.2, we found that even some 2-year-olds computed implicatures for Sg/Du/Pl expressions. Together, these results suggest that implicature can support the acquisition of exact number word meanings.

Keywords: number cognition, scalar implicatures, dual morphology, Slovenian

PA.e - 035 The role of relative age in the diagnosis of ADHD

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ADHD is one of the most common neurological disorders and its prevalence is on the rise. As ADHD is a developmental disorder, developmental considerations should be part of the diagnostic process. However, recent research from several countries shows that developmental considerations might not be given the appropriate attention. The research indicates that the relative age of the patient (relative to his/hers classmate's ages) plays a significant role in the diagnosis of ADHD: The younger children in the class have a higher chance of being diagnosed with ADHD. This raises the question whether some of these diagnoses in the younger children were in fact necessary.

To further check this, we analyzed the results of more than 90,000 cases of computerized ADHD tests ("MOXO"), taken by children in ISRAEL. These results show significant differences in test re-

sults based on relative age. Overall – Younger children failed the test significantly more than their peers. Moreover, the research shows that These differences were stronger in ages 6-8 and gradually weakend in older ages (10-12).

Since Computerized tests can be a major part of the diagnostic procedure, These results show that relatively young children are at higher “risk” of failing the computerized test, and consequently raise their chances of being diagnosed with ADHD, sometimes unnecessarily. In some cases this can be avoided if proper interventions are implemented. Possible interventions and points of emphasis for diagnosis will be suggested.

PA - 036 Seeing iconic gestures promotes second-order verb generalization in preschool-aged children.

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Preschool-aged children benefit from seeing iconic gestures during verb learning, when those gestures depict the actions to which the verbs refer. Iconic gestures can facilitate verb learning by highlighting verb meanings (e.g., wiggling the index and middle fingers to depict walking).

Previous research is limited because it only shows that seeing iconic gestures promotes first-order generalization of individual verb meanings. That is, children learn that a verb refers to the referent depicted in iconic gesture and they can extend this individual verb meaning to novel events that show the verb referent. However, it remains unclear whether seeing iconic gestures also promotes second-order generalization of a sub-category of verbs, which children can use when they subsequently encounter novel verbs of the same type. This study investigated whether seeing iconic gestures depicting verb referents promotes first- and secondorder verb generalization.

We taught 3-to-4-year-old children twelve novel verbs describing manners of motion. Children who saw iconic gestures depicting the verb referents during training generalized the verbs to novel events (first-order generalization) more often than children who saw interactive gestures, which did not depict the verb referents. Furthermore, immediately afterwards (Experiment 1, N = 48) and one week later (Experiment 2, N = 48), the iconic-gesture-group outperformed the interactive-gesture-group in subsequent generalization trials with different novel verbs (second-order generalization), in which all children saw interactive gestures.

Thus, seeing iconic gestures has a far-reaching effect on verb learning and can help children figure out how to learn verbs that describe manners of motion.

POSTER SESSION A
THURSDAY

PA - 037 Are emotions pedagogically transmitted?

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The Social Biofeedback (SB) theory (proposed by György Gergely and John Watson) constitutes a model of emotional Self consciousness. Gergely, Fonagy, Unoka, Futó and others hypothesise a cooperation between Natural Pedagogy theory (NP) and SB model. The former is a transmission of cultural knowledge system based on ostensive communication between adults and infants; the latter takes into account the infant's internalisation process of contingent "marked" emotions-mirroring displays. Gergely et al.'s theoretical proposal about NP' and SB's cooperation is based on the equivalence between marked affect-mirroring displays and infant-directed cues of ostensive communication intended as referential knowledge manifestations. According to their proposal, the grounding elements of NP system (i.e., the comprehension of the referential nature of ostensive communication) would make possible the social construction of the infant's inner emotional Self. Such a claim entails that inner emotions are taught by adults to infants through social interactions based on the referential-expectation power provided by the infant interpretation of ostensive cues. I will argue a theoretical incompatibility between NP and SP. Even if we assume that the 'markedness' of emotion displays constitutes a pragmatic form of ostensive communication, the automatic involvement of pedagogical stance is not granted by sharing the referential nature of ostensive cues. In fact, NP stance requires a high degree of motivation: the intention of teaching, that is absent in the parental mirroring described by SB. The latter is a dynamic exposed to parents' fragile psychological factors which go beyond (or precede) their motivational attitudes for efficient transferring of cultural knowledge.

PA - 038 The relationship between understanding numerals and logical connectives: the case of 'and'. A study in 3-year-old childrenIrene Canudas-Grabolosa¹, Elena Pagliarini¹ and Luca L. Bonatti^{1,2}

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In a finite domain, words with logical valence such as 'and' are equivalent to numerals ('two cats' is equivalent to 'cat A and cat B'). They also share the property that, depending on context, they have an 'at least' reading ("logical reading": e.g., There are two cats' means 'there are at least two cats') or an 'exact' reading ('exactly two cats;') (Panizza et al 2009, Chierchia, 2013).

Here we begin studying the relations between these logically equivalent expressions across development, in order to understand whether they are connected by a common primitive logical operation. As a first step, we compare the understanding of numerals and the logically equivalent conjunctive form in children between 3 to 4 years old, an age in which they quickly progress in their understanding of the exact meaning of the first elements in the numeral series (Almoammer et al 2013). We use a well-known experimental method, the give-a-number task (Wynn, 1992), and we adapt it to conjunc-

tives to obtain a comparison between the two logically-equivalent expressions. We find a correlation between the exact understanding of number and the exact understanding of 'and'. However, error patterns suggest that these may not be clearly tied to common logical operations. As a following step, we will extend our investigation to more complex contexts, focusing on upward and downward entailment expressions, where the meaning of the logical expression may vary according to the structural context in which they are embedded.

PA - 039 Development of semantic control from 5-10 years

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Children's acquisition of concepts is fundamental to emerging cognitive, but their flexible use of concepts is less well understood. Semantic control refers to cognitive processes that bring to mind the appropriate concept(s) relevant to the goals of semantically driven tasks. This has received considerable research attention in the neuropathology of older adults, particularly in semantic aphasia (post-stroke) and in older adults (Badre, Poldrack et al. 2005; Hoffman, 2017; Rogers, Patterson, Jufferies & Lambon Ralph, 2015). The present study aimed to identify the developmental progression of semantic control. Five semantically-driven tasks including naming, sorting, matching by item and relation were administered to children aged 5-10 years. Most measures included an identical set of concepts that were graded by typicality. Performance varied across tasks and ages, implicating controlled retrieval processes. A clear typicality advantage was consistent for naming and picture sorting under specific categories, when tasks were feature-driven. A graded advantage for typicality was found on matching tasks, depending on task demands. When matching by item, children benefited from more typical items only when distractors were distally related to target (e.g. lion-rabbit), not when proximally-related (lion-cheetah). Conversely, when matching by category relation, the benefits of typical items were seen only with proximal, not distal, distractors. Overall, the study implied novel evidence for semantic control process invoked according to task demands in mid-childhood, consistent with the Controlled Semantic Cognition framework. Age-differences will be discussed relative to reports of qualitative shifts in children's semantic cognition.

POSTER SESSION A
THURSDAY

PA - 040 "In MY Opinion": Children and adults' understanding of the origins and markers of subjective disagreement

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How do children come to understand that some of the things we say, e.g., that something is "pretty", or even that a day is "cold", are subjective? Here, we use judgments of faultless disagreement--disagreements where neither person is wrong-- to assess adults' and children's developing sensitivity to

the subjectivity of different utterances. In particular, during a period (5.5-7 years) when children are receiving curricular instruction about differences between facts and opinions, we test the function of explicitly marking a statement as an “opinion” as a cue to subjectivity.

Adults (Experiment 1) and children (Experiment 2) saw ten exemplars of a novel object kind that varied in level of height and spottedness, and evaluated whether an eleventh exemplar was, e.g., “tall” (yes/no), “pretty”, or “spotted”. Participants then saw a puppet being introduced to only one extreme half of the array, and as a result asserting the opposite of the participant’s evaluation (e.g., denying that the critical object was “tall” when they had only the tallest five objects for reference.) In one of two counterbalanced blocks, the puppet explicitly framed every dissenting statement with “In MY opinion...” Afterward, participants answered whether they and the puppet “could both be right,” and explained why.

Remarkably, explicit opinion framing did not influence faultless disagreement judgments for either sample. Though children largely rejected the speakers’ dissenting opinions, both they and adults were less likely to do so for words like “pretty” and “tall,” reflecting a developing sensitivity to variations in the subjectivity of different sorts of utterances.

PA - 041 Hippocampal maturation drives memory from generalization to specificity during childhood and adolescence

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Adaptive learning systems need to meet two complementary and partially conflicting goals: detecting regularities in the world versus remembering specific events. The hippocampus keeps a fine balance between computations that extract commonalities of incoming information (i.e. generalization through pattern completion) and computations that enable encoding of highly similar events into unique representations (i.e. memory specificity through pattern separation). During early ontogeny, the rapid and cumulative acquisition of world knowledge through generalization contrasts slower improvements in the ability to lay down highly specific, long-lasting episodic memories. In this talk, I will highlight recent behavioral and neuroimaging evidence suggesting that maturational differences among subfields within the hippocampus contribute to the lead-lag relation between generalization and specificity during childhood and adolescence. I propose that developmental changes within the hippocampus affect the fine balance between specificity and generalization across development.

PA - 042 Reciprocity across distributive games

Martina Vogelsang, Wiebke Eden, Mirjam Ebersbach

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Research on reciprocal sharing revealed that children are more likely to share a resource if they have been shared with beforehand (e.g., House et al., 2013) and that they modify their willingness to share according to the intentions of their partner (e.g., Vogelsang & Tomasello, 2016). In the current study, 91 preschoolers played with a puppet who three times either shared half of her beads with the child or took half of the child's beads away. The children could then choose between an equal distribution (one bead for each player) and an alternative distribution that benefited either the child or the puppet (see Fehr, Bernhard, & Rockenbach, 2008). Children with a positive antecedent sharing experience shared more with that puppet than those with a negative antecedent sharing experience. In order to investigate whether this behavior is directly reciprocal in a sense that this difference in sharing behavior occurs only with the familiar partner who had previously shared with the child, we also asked the children to choose between the same allocations for themselves and an unfamiliar second puppet. In fact, children with a negative sharing experience treated the familiar puppet differently than the unfamiliar puppet, as they shared less with the familiar puppet who had taken beads away. Children who had a positive sharing experience treated both puppets equally. There were also differences in the prosocial behavior between the three distribution games which are being discussed.

POSTER SESSION A
THURSDAY

PA - 043 Joint attention and mental state talk about desire in young children in Croatia

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The aim of this research was to investigate the relationship between the early theory of mind abilities, assessed through measures of initiating joint attention (IJA) and responding to joint attention (RJA) and mental state talk about desire in children aged 18 to 36 months.

The research included 106 participants, aged 17 to 37 months, from Croatia. Initiating and responding to joint attention were assessed using the Early Social Communication Scales (Mundy et al., 2003). In order to collect the speech samples needed for mental state talk analysis, children were videotaped interacting with their parents for 15 minutes. All the videos were later transcribed. The analysis included searching for all of the children's uses of the verbs "htjeti" (want) and "željeti" (wish) as well as their use of the first conditional. The next step included searching for all the utterances in which children used the above mentioned linguistic means to refer to desires as mental states. Results show a significant positive correlation between the quantity of mental state talk about desire and RJA, but not IJA. This is an important finding because it enables us to make the connection between RJA, which we consider to be the index of the early TOM development, and talk about

mental state of desire in children aged 17 to 37 months. In other words, we can conclude that the children aged one and a half to three years who have better theory of mind development talk more about the mental state of desire.

PA - 044 Theory of Mind Interacts with Semantic Comprehension in 14-month-old Infants

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Infants employ sophisticated communicative and Theory-of-Mind (ToM) abilities well before they start to talk. In a previous study, using an object naming paradigm in a live puppet theater setting, 14-month-olds produced an N400 to semantic incongruity experienced by another person, who had a false belief about the identity of the named object (Forgács et al., in press). The current studies further explored this phenomenon in three electrophysiological experiments, using the same paradigm. First, we replicated our initial finding: we induced a false belief in the adult observer by replacing an object with a second one without her knowledge, and then named it correctly from the perspective of the infant – which was incongruent with the false belief of the observer. Intriguingly, the replicated N400 effect was not accompanied by a later frontal negativity, as in the original study, but by an early frontal positivity. In the second study, we inverted the situation: the objects were always labeled incongruently from the perspective of infants, but sometimes congruently with the adult observer's false belief. In the third study, we used the original paradigm, but we replaced the first object with another one of the same kind. The latter two follow up studies indicated no N400 effect, but an early frontal positivity. These results together argue against an initial, perception-based ToM, and suggest that language comprehension relies on ToM earlier than previously believed by allowing infants to track the understanding of communicative partners.

POSTER SESSION A
THURSDAY

PA.e - 045 Speaking in Two Tongues: Bilingualism & Metaphor

Lydia Burchett, Mélanie Gréaux, Nausicaa Pouscoulous

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Metaphor is multiform: the interpretative processes for novel and conventional metaphors, for instance, are different. Interestingly, differing linguistic-cognitive skills in monolingual and bilingual children could also result in different abilities to interpret figurative language. Bilingual children seem to have enhanced conversational skills; we therefore expected them to outperform monolinguals in their comprehension of novel metaphors, since this requires the ability to construct a context-specific

meaning. Conversely, we predicted that monolingual children, who typically have larger vocabularies, would do better than bilinguals with conventional metaphors.

We used a picture selection task to assess novel and conventional metaphor comprehension. Twenty English monolingual and twenty French-English bilingual 3-to-5-year-olds of similar socio-economic background heard descriptions including a metaphorical expression (e.g., “After her bath, Anna is a hedgehog”) and had to choose among three pictures the one corresponding to the story (e.g., a girl coming out of the bath with very spiky hair). Additionally, children were tested on a standardised vocabulary measure (PBVS, Dunn & Dunn, 1982), inhibitory control (taken from Carlson & Moses, 2001), as well as comprehension and production of the metaphor task key words.

Contrary to our prediction there was no difference of performance on any task between monolingual and bilingual children, a finding which goes against an argument for ‘bilingual advantage’. Importantly, while – in line with recent findings – pre-schoolers showed good comprehension of novel metaphors, they all had a poor understanding of conventional metaphors. This suggests differences in novel vs. conventional metaphor processing might find their roots in diverging developmental patterns.

PA - 046 Factors influencing behavioral consequences of spontaneous belief attribution in adults

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Humans spontaneously attribute mental states to others. For example, using a computer-based avoidance-false-belief task Buttelmann and Buttelmann (2017) showed that 5-7-year-old children attributed beliefs to bystander agents, and that these beliefs - although irrelevant for solving the children’s task - influenced the children’s response behavior. Participants were asked to place a cat in one of three boxes by avoiding the one box that contained an angry dog. Thus, the two empty boxes were equivalent response options. Meanwhile, the authors manipulated the beliefs of a bystander agent, who was also visible on screen. The finding was that the children not only avoided the box that actually contained the dog, but also the one the bystander agent thought would contain the dog. For adult participants, however, results were less clear: their box choice did not clearly indicate spontaneous belief attribution. In the current studies, we examined whether higher cognitive resources (Study 1) or self-imposed time pressure (Study 2) made adult participants seek alternative task solutions. After replicating the original condition in both studies, Study 1 (n=89) revealed that increased cognitive effort did not have a significant impact on participants’ box selection. However, in Study 2 (n=91), a predetermined time delay between stimulus onset and response phase provoked a box choice that was similar to that of children in the original study. Thus, although both adults and children spontaneously attribute beliefs to bystander agents, time pressure seems to make adults suppress the impact of this attribution on their deliberate decision making.

PA - 047 Does violation of expectation result in better learning? A replication of Stahl & Feingenson (2015)

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We attempted to replicate the findings of Stahl & Feingenson (2015), investigating whether infants show superior learning following the violation of spatiotemporal continuity.

Twenty-four 12-month-olds (350 – 379 days, $M = 367.79$, $SD = 8.82$) were tested using a design and stimuli set that closely resembled the corresponding events in the original study, with the exception that all events were pre-recorded and presented on the eye-tracker.

Infants saw an event that either accorded with or violated the principle of spatiotemporal continuity, followed by the demonstration of a hidden auditory property of the object. At test, the familiar object was paired with a novel distractor. Following a silent baseline, both objects were moved concurrently while the familiar sound played.

A 2x2x2 repeated measures ANOVA with phase (baseline/test), object (target/distractor) and condition (violation/control) revealed a significant main effect of object ($F(1,22) = 16.146$, $p = 0.001$), with more looking to the distractor ($M = 61.18$, $SD = 2.78$) compared to the target ($M = 38.81$, $SD = 2.78$). Importantly, there was no significant object X phase interaction ($F(1,22) = 0.144$, $p = 0.708$), and no object X phase X condition interaction ($F(1,22) = 0.158$, $p = 0.695$).

Contrary to the findings of the original study that infants learn better following a violation, infants in our study showed a novelty preference in both conditions, indicating no learning of the auditory property, irrespective of the presence or absence of a violation.

PA - 048 Bridging the Gap Between Past and Present: Narrative Nonfiction in the History Classroom

Emma Browning

King's College London, UK

Narrative is seen as the 'fundamental instrument of human thought' (Turner, 1996:4), yet in the Key Stage 2 classroom (pupils aged 7-11 years), narrative is often associated with reading for enjoyment, whilst nonfiction is commonly used to support learning in content-based subjects, such as history (Marriott, 1986; Medwell, 2001; Bortnem, 2008). If narrative is so essential, it might be harnessed as a powerful tool to support learning. This research aims to explore whether differences in the ways in which children interact with narrative and nonfiction texts might affect the quality and strength of learning in the history classroom. A comparative experiment was conducted to explore whether these text types affect learning in different ways. Participants were 78 children (aged 9-10 years old). Interventions were delivered to participants over a period of three weeks, lasting approximately 45 minutes each; they comprised a series of short tasks to activate prior knowledge needed to understand a text which was subsequently read to participants. Half of the participants were read a narrative nonfiction text; the remaining half, nonfiction. Texts were matched according to content

and complexity. Finally, participants discussed questions on the topic in small groups. Pre-, post-, and post-post-assessments were conducted to assess and compare learning and retention of learning. Repeated measures ANOVAs showed that participants in the narrative condition made greater gains over time, specifically in relation to simple substantive and causal knowledge. This presentation will explore the findings of this research and possible implications for the classroom.

PA - 049 Verbal performance limitation in the pragmatic skills of sign language users - A cognitive developmental perspective on atypical humor comprehension

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Background: The study addresses the effect of verblivity in pragmatic- and humor comprehension. It sets out to explain the concept and influence of verbal performance limitation and its role in pragmatic competence.

Methodology: With experimental methods using verbal and non-verbal humor trials and mentalization tasks the study targets performance limitation and its effect on comprehension skills in humor tasks. The non-verbal humor tasks are here adapted to a group of children with hearing disability. The research on NT subjects (Author 2012, 2015) also drew up a differential-diagnostic measure of social-cognitive and pragmatic abilities (among these humor comprehension skills). The study aims to clarify issues of verbal - non-verbal dissociations of language and mentalization abilities in development (cf. Győri et al. 2007).

Findings, corollaries: The investigation of the different developmental and cognitive pathways of language and social-cognitive abilities helps us understand the differential-diagnostics of developmental disorders, clarifying the causal background of such disabilities which can in turn, influence the nature of therapeutical interventions. The examination of verbal performance limitation of children with hearing disabilities can further therapeutic methods that aim to involve subjects in more natural social settings.

Conclusions: In short, performance in such tasks testing higher level discourse skills heavily depends on the channel through which we test the given skill and ability (Győri et al. 2007), so careful measures, which can control for factors of competence vs. performance, are crucial in a valid and reliable methodology targeting pragmatic abilities of the hard of hearing (Author 2008, 2012, 2015).

PA.e - 052 Children's Expectations for Selective Comforting Among Friends

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Friends care for each other. These friendly concerns produce selectivity in choices about how and when to support others. Preschool-age children track some of these patterns, expecting partiality

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in friends' resource-sharing (Lieberman & Shaw, 2017; Olson & Spelke, 2008). However, children may hold different expectations regarding selectivity for other types of prosocial behavior; selectivity in responses to more extreme negative states may be expressed differently. This study therefore investigates the developmental trajectory of children's expectations for links between comforting and friendship, across multiple decision contexts.

Experiment 1 investigates children's emerging expectations for selective comforting. Across 6 trials, 4-to-6-year-old children ($N=72$) viewed a protagonist interact with a friend over an equally positive non-friend. When the protagonist became injured, children chose the friend or non-friend to comfort her. Only 6-year-olds were more likely to choose the friend ($p < 0.01$). Experiment 2 ($N = 44$; 72 planned) investigates children's expectations for selecting comforting in a different decision context. Rather than asking which members of a population are most likely to comfort the protagonist, this experiment flips the choice: here, the friend and non-friend both are injured, and the protagonist can only comfort one.

Analyses on the full dataset will compare children's reasoning across experiments. Our hypothesis is that younger children in Experiment 1 may not expect selectivity because they believe a general obligation to assist injured others will motivate both the friend and non-friend alike; in contrast, Experiment 2 forces children to compare the protagonist's relative motivations toward each character.

BC  D



PB - 001 Expectations of shared cultural knowledge hinder children's false belief attribution

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PB - 002 What Does Sulking Behavior Look Like? A Coding Scheme for Investigating Hurt Feelings in Young Children

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PB - 003 Different numerical expectations of infants and adults in object individuation process.

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PB - 004 The development of visual working memory over the second year of life

Chen Cheng, Sangya Dhungana, Zsuzsa Kaldy, & Erik Blaser

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PB - 005 Infants' temperament and their understanding of others' mental states

Frances Buttellmann¹, Michaela Riediger¹, David Buttellmann²

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PB - 006 Beliefs Determine our Intentions - But when do Children Understand that?

Britta Schünemann, Marina Proft, Hannes Rakoczy

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PB - 007 The effect of Infant Directed Speech on face processing in 4-month-old infants

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PB - 008 Learning from animals? The case of tool function learning in the context of interspecific demonstration with 4-year-old children

Uyen Tran¹, Dalila Bovet¹, Ildikó Király², Rana Esseily¹

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PB - 009 Infants' searching behaviors under informational uncertainty

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PB - 010 Children's understanding of Moore paradoxes and logical contradiction

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PB.e - 011 Children spontaneously re-create core properties of language in a new modality: the development of a gestural code system in dyads of preschool peers

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PB.e - 012 The effect of disagreement on children's source memory performance

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PB - 013 Comparing adults' gaze patterns in true belief, false belief and ignorance situations

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PB - 014 "Where is the sticker now?" A Dimensional Change task for 3-5-year-olds with minimal verbal demands.

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PB - 015 Categorization similarities and differences in autism spectrum disorder: the role of feedback in a random dot pattern task

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PB - 016 Examining the correlation between mindreading and nonverbal humor comprehension - A study of deaf children

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PB - 017 Speaker Identification Based on Epistemic Reasoning in Children with/without ASD: A Test with the “Knowledge-Based Ventriloquism Illusion” Task

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PB - 018 The effect of age on task switching performance is modulated by working memory load

Félice van 't Wout, Marike O'Donnell, Rebecca Saw, Christopher Jarrold

University of Bristol

PB - 019 Children's Sense of Commitment to a Partner who has Invested in a Joint Action

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PB.e - 020 Neural sensitivity to facial signals of trustworthiness in 6-month-old infants

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PB.e - 021 Brain-to-brain coupling between adults and infants in a live imitation paradigm

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PB - 022 Delayed Theory of Mind Development in Children Born Preterm

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PB - 023 Components of Pupillary Response during Visual Orienting Task Predict Focused Attention during Interactions of 8-month-olds

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PB - 024 Children reassess an informant's misleading claim in the light of later empirical evidence

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PB.e - 025 Bio-Behavioural Synchrony during Caregiver-Child Problem-Solving

Trinh Nguyen¹, Ezgi Kayhan², Hanna Schleichauf², Daniel Matthes², Pascal Vrticka², Stefanie Hoehl^{1,2}

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PB.e - 026 Effects of social comparisons on human and nonhuman primates' task performance

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PB - 027 Assessing caregiver's touch: a comparison of measures

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PB - 028 The sensitive period for associative learning of non-adjacent dependencies: an ERP-study

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PB - 029 Infants representation of causal relations: A pupillometry study.

Parvaneh Adibpour, Jean-Rémy Hochmann

Institut des Sciences Cognitives - Marc Jeannerod, CNRS, Lyon, France

PB - 030 Learning to construct sentences in Spanish: a replication of the Weird Word Order technique

Javier Aguado-Orea

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PB - 031 Does Adult-Infant Play Facilitate Infant Category Learning?

Dave Neale^{1,2}, Hannah Puttre², Hannah Tokish², Kathleen H. Corriveau⁴, Kathryn A. Leech⁴, Roberta M. Golinkoff², Kathy Hirsh-Pasek⁵

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PB - 032 Non-verbal lying in three year olds: An interaction-based experiment to measure spontaneous lying in children

Mareike Heinrich, Ulf Lischowski

University of Hamburg, Hamburg, Germany

PB - 033 The development of conceptual perspective taking

Michael Huemer, Teresa Haslehner, Josef Perner

University of Salzburg

PB.e - 034 A new method for examining visual working memory in two-year-olds

Jessica Beal Applin, Melissa M. Kibbe

Boston University, Boston, MA, USA

PB.e - 035 Infants do not understand helping as a second-order goal

Laura Schlingloff, Denis Tatone, Barbara Pomiechowska, Gergely Csibra
Cognitive Development Center, Central European University, Budapest

PB - 036 Improving transfer of inductive rules through familiar names in adults and children

Yulia Sudorgina, Alexey Kotov
National Research University "Higher School of Economics", Moscow, Russia

PB - 037 Selective trust, accessibility and ascription of traits – Comparing children with adults under limited cognitive resources

Franziska Brugger, Jonas Hermes, Teresa Illner, Aaron Plate, Tanya Behne & Hannes Rakoczy
University of Göttingen, Germany

PB - 038 The role of intentions and conceptual understanding in symbolic reasoning

Blair Goldstein, Jessica Sullivan
Skidmore College, Saratoga Springs NY, USA

PB - 039 Exploratory, cross-domain investigations into the nature, origin, and time-course of concepts of infinity

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PB - 040 The development of gender stereotypes across the developmental timespan

Jessica Sullivan, Blair Goldstein, and Corinne Moss-Racusin
Skidmore College, Saratoga Springs, NY, USA

PB - 041 Does the latency before an action predict how controlled the behavior is?

Eva A. Aeschlimann, Sonja Kälin, Nike Tsalas and Claudia M. Roebbers
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PB - 042 Developmental study of the mid-frontal theta power involvement in cognitive control during childhood

Nicolas Adam^{1,2}, Agnès Blaye^{2,3}, Rasa Gulbinaite^{4,5}, Arnaud Delorme^{1,2,6}, Jean-Michel Hupé^{1,2} & Chloé Farrer^{1,2}

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PB - 043 Ostensive signals contribute to the segmentation of actions in toddlers

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PB.e - 045 An Inflection Point in Toddlerhood for Asymmetric Spatial Biases

Eloise West, Koleen McCrink

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PB - 046 Why did you break a commitment? Three-year-olds' sensitivity to appropriate motives behind a commitment failure

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PB - 047 The role of attention in visual perception and how it is represented by social agents in social agents

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PB - 048 Contrasting the roles of task selection and task execution in cognitive control development using the double registration procedure

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PB - 049 In touch with your body: Does affective touch help infants to detect body-related multi sensory synchrony?

Letizia Della Longa, Martina de Eccher, Elena Polesello, Teresa Farroni

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PB - 050 Persistent and non-persistent behaviour in kindergarten children

Niamh Oeri, Sonja Kälin, David Buttelmann

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PB - 051 Social Information Use and Cultural Diversity in Vanuatu

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PB.e - 052 Do preverbal infants expect group members to pursue goals by the same inefficient means-actions?

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PB - 053 The impact of coordinated movement and ostensive cues on young children's commitment to joint action.

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PB - 054 Exploring the representations of early logical reasoning: the power and limits of neural network models

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PB - 001 Expectations of shared cultural knowledge hinder children's false belief attribution

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In this research project, we investigate the hypothesis that making sense of behavior depends on the interaction of two processes: a dynamic mentalizing process and a more rigid one that helps us make inferences about the background knowledge of others. To investigate the question, we applied the classic Smarties task with 4-year-old children in two conditions. The Ostensive condition followed the classic procedure of the task where an experimenter presents children with a Smarties box and shows them that it contains pencils instead of chocolate. Then, children are asked what another person would think is inside the box. In the Non-ostensive condition, instead of showing children the contents of the box, the experimenter accidentally knocks it over, revealing the pencils inside. Our results suggest that children in the Non-ostensive condition were more likely to correctly attribute the belief to another person that the box contains chocolate (18 out of 34) than children in the Ostensive condition (10 out of 34). We suggest that this pattern of results can be explained by children's bias to interpret the information received in an ostensive context as part of shared cultural knowledge and this leads to an overgeneralization error. Currently, we are running a follow-up experiment on this question by investigating whether children would commit less overgeneralization errors when they have to make an attribution to an out-group member as opposed to an in-group member.

PB - 002 What Does Sulking Behavior Look Like? A Coding Scheme for Investigating Hurt Feelings in Young Children

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Feeling hurt is an essential but rather understudied, emotional phenomenon in children. As sulking behavior is a promising means to investigate hurt feelings, we conducted three studies that served to describe this behavior and to develop a comprehensive coding scheme for sulking. Here, we report three studies. The first study tested candidate features in an online survey that used parental and teacher's report. In the second study, parents kept diaries for 3 weeks. We analyzed frequencies of features and sequential patterns of sulking behavior. Finally, we analyzed YouTube videos, showing that the coding scheme that resulted from study 1 and 2 could be reliably applied and determined a minimal number of necessary features as a classification threshold. The resulting coding scheme includes the following features: silencing, distancing, turning away, gaze avoidance, gazing up with head lowered, arms crossed, head lowered, pouting lips, eyebrows narrowed, as well as utterances of illegitimate devaluation, of frustrated autonomy, and of relational distancing. What all varieties

of sulking seem to have in common is thus a withdrawal from an ongoing interaction. We discuss differences and overlaps to related other emotions such as disappointment, shame, and anger.

PB - 003 Different numerical expectations of infants and adults in object individuation process.

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Object individuation process allows us to individuate and identify multiple objects through space and time. Here we provided evidence for the hypothesis that infants before the first year of life can individuate different objects when observing 'agent' (self-propelled) vs. 'inert' objects. In two experiments we tested 10-month-olds' infants using the violation of expectation, where they were shown objects that alternately emerged from behind a screen; one of them was 'agent' object with an autonomous movement, while the other was 'inert' object and it was moved by a hand. The objects were exactly the same in featural components such as color, shape and size, but they differed in the kind of movement shown (self-propelled vs. passive). Then the screen was removed, showing either one object or two objects. Infants showed the violation of expectation observing significantly longer the one-object outcome. These findings were replicated in Experiment 2 where we controlled the trajectories of the movements and the presence of the hand in both agent and inert part. Finally, we presented the same animations of Experiment 1 to adults and we found different numerical expectations compared to infants. Indeed, contrary to them, they expected one object behind the screen. These results suggest that infants rely primarily on object dynamic information while adults' numerical expectations were determined by static object features such as shape, size and color.

PB - 004 The development of visual working memory over the second year of life

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Visual working memory (VWM) skills emerge early, and are critical for nascent cognitive abilities and later academic achievement. However, few studies have investigated the early development of VWM, and none that we know of have used a longitudinal design. Here we used the Delayed Match Retrieval paradigm (Kaldy et al., 2016) on an eye-tracker to investigate infants' VWM development over their second year. 30 participants (13 females) were tested at 15 months of age (Visit_1, M=15.6 months, range:14.3-17.4), and again when they were 19 months old (Visit_2, M=19.5 months, range: 17.8-22.6). In both experiments, abstract objects were presented on the faces of virtual cards. Two cards were shown on screen, then flipped face-down. After that, a third card was shown, whose

face matched one of the previously-shown cards. After a brief, 2 s delay, the matching card was revealed, accompanied by a reward animation. 12 trials were run. VWM performance was calculated as the percentage of trials where the first anticipatory look during the delay period was to the correct (matching) card. Overall performance was at chance at Visit_1 (45% correct, $p > 0.05$) but significantly above chance at Visit_2 (56% correct, $p = 0.019$). We also found a significant age-related increase in performance ($r = 0.24$, $p = 0.013$), but no significant individual stability ($r = 0.03$, $p = n.s.$). Interestingly, the correlation between number of completed trials at Visit_1 and Visit_2 was marginally significant ($r = 0.36$, $p = 0.054$), suggesting that task persistence is stable at the individual level. Data collection from Visit_3 of the same sample (at 24 months) is ongoing.

PB - 005 Infants' temperament and their understanding of others' mental states

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Research on the ontogeny of the ability to understand others' mental states (Theory of Mind, ToM, Premack & Woodruff, 1978) has a long tradition. Previous research focused on the understanding of others' (false) beliefs, which is now being studied already in infancy. In contrast, previous findings on social-emotional development, specifically temperament, as a possible influencing factor on the development of ToM, tend to focus on preschool children. Results to date (Lane et al., 2012; Wellman et al., 2011) support the Emotionality-Reactivity Hypothesis (Hare & Tomasello, 2005) in preschoolers, which assumes that a reactive temperament is detrimental to ToM development. A single study discovered a connection between temperament in infancy (18 months) and the development of ToM at the age of 3 years (Mink, Henning, & Aschersleben, 2014). There are so far no published studies on the connection between infant temperament and infant ToM.

The current study focuses on this gap: we investigate the possible relationship between 16-month-old infants' temperament and their implicit understanding of others' (false) beliefs. In addition, we study the relationship between these two constructs and infants' implicit understanding of divergent desires of others. Implicit false-belief understanding and the implicit understanding of divergent desires of others are assessed using interactive tasks. Infants' temperament is determined by parental assessments using the Early Childhood Behavior Questionnaire (Putnam et al., 2006). Results show that infants' understanding of others' mental states correlates negatively with their negative affect ($r = -.480$, $p = .028$), which supports the Emotionality-Reactivity Hypothesis already in infancy.

PB - 006 Beliefs Determine our Intentions - But when do Children Understand that?

Britta Schünemann, Marina Proft, Hannes Rakoczy

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Intentions are the subjective reasons for why people act (Astington, 2001). Hence, making sense of others' actions relies fundamentally on a fully-fledged concept of intentions: One has to appreciate that acting intentionally requires not only the desire for a certain outcome, but also the belief that the planned action will indeed achieve this desired outcome (Perner, 1988). While the ontogenetic development of the desire-component has been investigated extensively (Baird & Astington, 2005), research has neglected the crucial belief-component of intentions. Consequently, to know certainly, when children's concept of intentions is fully developed, research is necessary on children's ability to appreciate that the outcome of an action which is based on a false belief is not intended. To this aim, we conducted two studies to compare children's performance on structurally similar belief and intention test questions regarding analogous scenarios in which an agent acts on false beliefs. Results of Study 1 (N=66) indicated that at age 6 children still fail to consider beliefs when ascribing intentions. An interesting pattern of correlations suggested, that even though a fully developed understanding of beliefs is necessary for the appreciation of the epistemic aspect of intentions based on beliefs, it is not sufficient. We are thus conducting a second study, which includes 7-year-olds and adults. Preliminary results (N=89 out of 110 planned) replicate the findings of Study 1 and suggest that while adults show no problems to consider beliefs when ascribing intentions, the fully-fledged concept of intentions is still developing at the age of 7.

PB - 007 The effect of Infant Directed Speech on face processing in 4-month-old infants

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Newborns and infants prefer faces with direct gaze over faces with averted gaze (Farroni, Csibra, Simion, & Johnson, 2002), and also show an enhanced N290 ERP component to them. One possibility is that direct gaze is an important source of information (Gliga & Csibra, 2007), suggesting that infants are specifically sensitive to communicative signal. (Csibra, 2010). In two ERP experiments we studied whether a different communicative signal, infant-directed speech (IDS), could also enhance face processing in 4-month-olds. In Experiment 1 infants heard a word, uttered either in IDS or adult-direct speech (ADS), followed by an upright face. In Experiment 2 faces were presented upside down. Only upright faces produced a N290 effect depending on the preceding speech, with faces preceded by IDS eliciting a larger N290 component. Such effect was not present with upside down faces. Instead we found a Nc effect, with a larger Nc component for upside down faces preceded by IDS compared to the same stimuli preceded by

ADS. These results show that for 4-month-old infants, IDS has a specific effect on face processing, enhancing the early stages of face perception, rather than merely increasing attention to them. We suggest that IDS generates communicative expectations in infants. When such expectations are met by a following stimulus – an upright face – infants are already prepared to process it, hence the N290 effect. When the stimulus is a non-communicative one – an inverted face – IDS increases the allocation of attention to the stimulus, hence the Nc effect.

PB - 008 Learning from animals? The case of tool function learning in the context of interspecific demonstration with 4-year-old children

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Social learning is known to be an important component of individuals' development of knowledge (Galef and Laland, 2005; Heyes, 1994). While there are many studies on social learning, less focus on the characteristics of the demonstrator that guide social learning. The demonstrator's language seems to be an important criterion for influencing learning as it implies that the demonstrator and the observer both belong to the same social group and share the same cultural background (Brooker and Poulin-Dubois, 2013; Kinzler et al., 2011). In this study, we test whether the species of the demonstrator can also influence social learning. Therefore, we are testing tool function learning with the paradigm of mutual exclusivity, which is the propensity of children to not use a tool in a new task, if they learned another function for this tool beforehand (Peto et al., 2018). We are currently collecting data with 4-year-olds. Children are randomly assigned to one of three conditions: a video of a human, a dog or a bird model demonstrating the use of four different tools. In the testing phase, children are given four new tasks and are asked to choose one tool among two (the demonstration tool or an alternative one). We then code their tool choice. We expect that children will form mutually exclusive tool function mapping and thus will choose the new tool, only when the demonstrator is human and they will choose randomly in the other conditions.

PB - 009 Infants' searching behaviors under informational uncertainty

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Infants' reaching and searching behaviors inform us about their mental representation (of an object, for example), memory and cognitive processes associated (Vishton, 2018). Here, we explored 12-month-old and 24-month-old infants' reaching and searching behaviors under informational uncertainty. Infants received three trials across which informational uncertainty (concerning a location of a hidden toy) varied. In the one-box trial, infants saw a toy being hidden in a box. In the two-box

trial, they saw a toy being hidden in one of the two boxes but did not see which one. In the three-box trial, they saw a toy being hidden in one of the three boxes but did not see which one. At the end of each trial, infants saw three boxes with lids closed and were asked to find the toy. Infants' total searching time and reluctance (time duration until infants touched any box) were measured as well as their accurate searching behaviors. Memory accuracy was coded only for the one-box and two-box trials. Only 24-month-olds' searching time linearly increased as informational uncertainty increased. By contrast, both 12-month-olds' and 24-month-olds' reluctance increased as information increased. Finally, both age groups' memory accuracy negatively correlated with searching time. No relationship was observed between memory accuracy and reluctance. A possibility that reluctance as a developmental precursor to infants' sensitivity to their own uncertainty is discussed.

PB - 010 Children's understanding of Moore paradoxes and logical contradiction

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Moore's paradox is that upon making a statement one cannot consistently declare a disbelief in what has been stated (e.g., "It is raining, but I do not believe that it is raining). According to John Searle, the paradox arises because when we assert that p, then we also express a belief that p. When do children first appreciate this paradox? How does it relate to the development of mindreading and the understanding of logical consistency? We report two studies examining this issue. In both studies, four age groups of children (5, 6, 7, and 8 years old) were presented with 25 pairs of sentences one of which was Moore paradoxical. In the second study another task was also administered where children had to detect logical inconsistency. In both studies we found a gradual, essentially linear relationship between age and Moore-paradox detection with no abrupt improvement between any two subsequent age groups. The detection of logical inconsistency improved in an accelerating fashion: there was no change between 5 and 6 years, a moderate change between 6-7 years, and a more expressed improvement between 7-8 years. There was no correlation between Moore score and consistency score in any of the age groups. An item analysis of the 25 questions in the Moore task indicated that item difficulty significantly correlated between any two age groups in both studies. We suggest that understanding Moore paradoxes in development is related primarily to mentalization development, and less strongly to the understanding of logical contradiction.

PB.e - 011 Children spontaneously re-create core properties of language in a new modality: the development of a gestural code system in dyads of preschool peers

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Being unable to communicate verbally – for example when traveling - adults can quickly revert to gesture and instantly create signs that allow them to communicate highly complex content. Thereby, they do not only demonstrate perspective-taking skills and a talent for iconic expression but also the insight that meaning can be created ad hoc. When does this ability emerge?

In a novel set-up similar to a skype-session, we invited children to play a coordination game in which they had to inform a partner in another room of the content of pictures on a wheel of fortune. As soon as the game was running, we cut the sound leaving children only with the visual impression of their partner. In several studies, children were required to develop ways of expressing simple concepts, concepts with predicates, and full sentences in order to select the correct item and succeed in the game. Whereas four-year-olds and older children were able to invent gestures on the fly, dyads of three-year-olds were only able to generate novel solutions once an adult experimenter provided them with a model solution. This illustrates that – at least in the domain of gestural communication – young children are able to learn a system of communication from skilled caregivers before they are able to invent it themselves in interaction with age-mates. Furthermore, dyads converge on the same gestures and gestures become more abstract over time. Similar processes have been observed in more naturalistic settings, most prominently in Nicaraguan Sign Language.

PB.e - 012 The effect of disagreement on children's source memory performance

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Research on children's source memory abilities has found that children under the age of five perform poorly. One reason for this might be that source memory tests for children have commonly targeted purely epistemic uses of source information. Here, we investigated to what extent young children are sensitive to the communicative functions of source information. One context in which source information is particularly useful in virtue of its communicative functions is disagreement. When faced with disagreement, the source of one's belief can serve as an effective way to prove its reliability. Thus, we asked whether children's source memory performance would improve in the face of disagreement. Four-year-old children learned about the contents of a container either through a first-hand (seeing) or second-hand (being told) source before being faced with a puppet who either agreed or disagreed with them about those contents. We found that children performed better in

reporting the source of their belief about the contents of the container to the puppet after having faced disagreement rather than agreement. Further, children were better at reporting source after having had second-hand compared to first-hand access to the container. These results suggest that conversational context can facilitate source report in four-year-olds.

PB - 013 Comparing adults' gaze patterns in true belief, false belief and ignorance situations

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Previous work on implicit false belief understanding suggests that adults incorporate another agent's false belief into their anticipatory looks: If an agent has interacted with an object at location A and the object has been moved to location B in the agent's absence, participants look more to location A than B when anticipating the agent's action (e.g. Senju et al., 2009; Schneider et al., 2012; Low & Watts, 2013). However, original findings are challenged by recent failed replication attempts (e.g. Kulke et al., 2018), raising many questions, including, most crucially, concerning the cognitive foundation of observed gaze patterns. Do these studies really measure false belief understanding or simpler processes such as tracking of ignorance? The aim of the current study, therefore, was to explore the cognitive foundation by comparing false belief and ignorance situations. To this aim we compared adults' looking times and first saccades in situations where the agent had a false belief (FB, transfer not witnessed), a true belief (TB, transfer witnessed) or was completely ignorant of the object's location (Ignorance, neither initial placement nor transfer witnessed). Results indicate that participants (N=75) look more to the real object location than to the initial location in TB, but at chance in both FB and Ignorance. Looking times in Ignorance neither differed from TB nor FB. Overall these data give a tentative hint that adults' gaze patterns are influenced by a mixture of different factors (e.g., real location, belief). Ongoing research will examine the robustness of this trend more stringently.

PB - 014 "Where is the sticker now?" A Dimensional Change task for 3-5-year-olds with minimal verbal demands.

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Our ability to flexibly adjust to changes in the environment relies on the capacity to flexibly switch attention between goal-related stimuli (task sets). Despite extensive research into the development of attentional flexibility, there are still few tasks suitable for children below the age of 4. We developed a novel set-shifting task with minimal verbal requirements. Fifty-eight 3- to 5-year-olds were presented with two trays, each of which was filled with substrate (paper/sand) with a cup (purple/

yellow) placed on top. Children were asked to find a sticker and could choose one tray per trial. For half of the children, one of the substrates was predictive, for the other half it was one of the cups. In the post-switch phase, all stimuli were exchanged (total change). For one group the same dimension remained predictive (e.g., substrate to substrate), for the dimensional change group a shift of attention was required (e.g., from substrate to cup). Results show that 1) this task is brief and easy enough for the majority of 3-year-olds to succeed, 2) despite the total exchange of stimuli the dimensional change group showed a significantly higher shift cost than the same dimension group (mean number of trials needed to reach criterion in dimensional change group: 16 (SD = 5.26); same dimension group: 12.07 (SD = 1.86), $W = 53$, $p = .002$), 3) shift costs from cups to substrate could even be induced when the pre-switch training was replaced by more general, rewarding experience with cups in another, unrelated task.

PB - 015 Categorization similarities and differences in autism spectrum disorder: the role of feedback in a random dot pattern task

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Numerous studies address cognitive features of people with autism. We propose that categorization can play a mediating role between perceptual difficulties and differences in other cognitive functions in autism. There are some contradictory results for differences in categorization. Many of the contradictions can be explained by methodological differences. In our study, we use random dot patterns to examine supervised and unsupervised categorization processes in a prototype formation paradigm. 30 children with autism (age $M=11.5$) and 79 typically developing children (age $M=10.6$) participated in our study. They made categorization tasks on a computer, in one session. In the prototype formation task, first we showed 20 high distorted pattern, and then they made decisions about category membership. In discrimination and generalization task, we added feedback about the answers' correctness. Typical developing children ($M=69.4$; $SD=13.2$) performed significantly better ($F(2.106)=4.602$; $p<0.05$) in the prototype formation task than ASD group ($M=66.2$; $SD=13.2$). There was no difference between groups in prototype recognition. There was also significant difference in generalization ($F(2.101)=3.222$; $p<0.05$) and tendentially difference in discrimination ($F(2.98)=2.994$; $p<0.1$). In both cases ASD group outperformed the typical developing children.

While there are intact prototype formation skill in ASD, the unsupervised categorization skills are lower than in TD children. But it seems that in supervised categorization ASD children has an advantage over the TD group. We suggest the parallel use of supervised and unsupervised paradigm to measure different categorization skills.

PB - 016 Examining the correlation between mindreading and nonverbal humor comprehension - A study of deaf children

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We know from previous research that language has a key role in the development of theory of mind (ToM) ability, and that the late language acquisition of deaf children of hearing parents might be responsible for the delay in the ability of mindreading compared to neurotypical children of the same age.

We studied ToM skills of deaf children of hearing parents and their correlations with pragmatic competence based on the theory arguing that ToM ability is a prerequisite of a successful pragmatic competence. In our study we used nonverbal tasks (ToM, humor) to see if we can eliminate the disadvantage deaf children have in verbal tasks. We also used Wellman and Liu's (2004) Theory of Mind Scale, a verbal ToM task, as a control condition.

When comparing the total performance of the verbal ToM task we found that hearing subjects performed significantly better than deaf subjects. However, if we compare the performances task by task, we see that for in the Content False Belief task there is no difference between the two groups. This finding is very interesting considering the other false belief understanding task, Explicit False Belief, where hearing subjects also performed significantly better.

Considering the nonverbal ToM task, we found no significant difference in the performance of deaf and hearing children, while in the nonverbal humor, deaf children performed significantly better than hearing subjects.

Our results suggest that deaf children perform better on nonverbal tasks, therefore the delay might represent a methodological issue, not the lack of ability.

PB - 017 Speaker Identification Based on Epistemic Reasoning in Children with/without ASD: A Test with the "Knowledge-Based Ventriloquism Illusion" Task

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Assuming and reasoning about the others' epistemic states is critical for human social communication. The developmental trajectory of this psychological "bias" and its possible variations is one of the enigmas for us. The current study examined whether and how people with/without ASD would reflect their epistemic reasoning when they observe interactions between others. Participants were 36/44 volunteers with/without ASD from 6 to 20 years old. We developed a task which is described

as follow: On the PC monitor 2 characters appeared side by side, and then vocal stimulus was presented from the loud speaker located below, and at the center of, the monitor. Then, the participant was asked to guess which character's voice it was, and answer with putting a magnet tag to one of the characters. During the task, the participant's visual attention was also measured with the Eye Tracker (X-300, Tobii). We prepared stories which varied in attentional state (represented in posture and gaze direction) of each character; for example, in a visual event, character A/B/both A& B could find a butterfly in his/her sight, and the voice "What a beautiful butterfly!" was presented. The overall results showed both TD and ASD participants successfully identified the speaker, based on the plausible epistemic states of the character embedded in the event. Though it remains unclear whether the psychological mechanism underlying the performance of each group was same or not, both groups showed spontaneous tendency to extract and use epistemic cues embedded in the event.

PB - 018 The effect of age on task switching performance is modulated by working memory load

Félice van 't Wout, Marike O'Donnell, Rebecca Saw, Christopher Jarrold

University of Bristol

Task switching experiments with children typically find that the ability to switch between tasks improves throughout childhood. However, the cognitive mechanisms responsible for this improvement remain poorly understood. To successfully switch between tasks, one must hold in working memory the stimulus-response (S-R) rules of the currently operative task-set. Consequently, one possibility is that age differences in task switching ability (indexed by "switch costs") are driven by age differences in working memory capacity. If this is the case, then age differences in the switch cost should be modulated by the working memory load of the tasks. In this experiment, 72 participants from three different age groups (aged 6, 9 and 21) switched unpredictably between a colour and a shape identification task. The working memory load of the tasks was either high (4 S-R mappings) or low (2 S-R mappings). As predicted, the effect of age on the switch cost was modulated by working memory load: When the working memory load of the tasks was high, children's (but not adults') performance suffered, especially on task repeat trials. These results suggest that working memory plays an important role in maintaining the task rules when the task repeats, and are consistent with the view that age differences in task switching performances are driven by developmental differences in working memory capacity.

PB - 019 Children's Sense of Commitment to a Partner who has Invested in a Joint Action

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Commitments facilitate cooperation between social partners. Previous studies have focused on children's understanding of commitments made through verbal communication (e.g., Evans et al., 2018; Gräfenhain et al., 2009; Kanngiesser et al. 2017). However, social partners sometimes also act committed even in situations in which no explicit agreements are made; it would be valuable to elucidate the mechanisms that give rise to such a 'sense of commitment' (Michael et al., 2015). Does one social partner's investment of costs in a joint action influence a second social partner's sense of commitment to their joint action? To test this, we manipulated the cost that children's partners paid, and measured children's sense of commitment, operationalized in terms of the effort they invested in the task. We modified a collaborative video game previously used to test the sense of commitment in adults (Székely & Michael, 2018). Children's task was to move a snake through a maze by repeatedly pressing a button. To unlock each game round, children's partners paid either a colorful sticker (high cost condition) or a simple sticker (low cost condition). We measured the frequency with which children pressed the button: a higher frequency of keypresses signals an increased sense of commitment to the joint task. Preliminary data suggest that 7- to 8-year-old children might have an increased sense of commitment to the joint task when their partner has paid a high cost compared to a low cost. Data collection of the main pre-registered study is in progress.

PB.e - 020 Neural sensitivity to facial signals of trustworthiness in 6-month-old infants

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One of the most important aspects of social interactions concerns the ability to discern social signals conveyed by other people. We know that adults and preschoolers easily distinguish between fine-grained differences in the level of trustworthiness expressed by faces. Nevertheless, only a few studies investigated the sensitivity to social signals of trustworthiness in infancy (Jessen & Grossmann, 2016; Jessen & Grossmann, 2017). By using computer-generated faces of male identities, these studies found no evidence of neural discrimination between trustworthy and untrustworthy faces, although both face types were discriminated from neutral faces. In this study, we aimed at investigating whether, at the age of 6 months, infants are able to discern between trustworthy and untrustworthy faces of truthful female identities. Infants were administered with a Fast-Periodic Visual Stimulation (FPVS) task, where two face identities were presented at a rate of 6 Hz (Baseline) following an Oddball paradigm. Every 1.2 Hz (Oddball), the trustworthiness level changed (a trustworthy

face every 4 untrustworthy faces, or vice versa, in a counterbalanced order).

Preliminary analyses show significant Signal-to-Noise Ratios (SNRs) at 6 Hz in occipital regions. More importantly, significant SNRs at 1.2 Hz were found in right occipital and right occipito-temporal regions. These results suggest that at 6 months infants are able to discriminate between different levels of trustworthiness, and that this discrimination takes place in brain areas known to play an important role in face discrimination. Future studies should investigate how fine-grained this sensitivity is, and how brain sensitivity is related to behavioural responses.

PB.e - 021 Brain-to-brain coupling between adults and infants in a live imitation paradigm

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Infants are sensitive to and prefer contingent social interactions indicated by specific behavioral (e.g., smiling) and neuronal responses (stronger mu desynchronization) towards contingently imitating adults compared to non-contingent adults. So far, research has predominantly explored infants' behavior or single brain activity during social interactions measured via imitation games.

However, adult hyperscanning research indicates that phases of behavioral synchronization (imitation) are associated with increased interbrain synchronization in the mu frequency band (Dumas et al., 2010). Brain-to-brain coupling might also be one mechanism of successful information transmission in adult-infant-dyads. Here, we establish a dual-EEG procedure to measure infants' (16- to 17-month-olds, N = 44, data collection is still ongoing) and female adult experimenters' (N = 4) brain activity simultaneously during live social interactions.

We will analyze differences in power spectral density on the mu frequency in infants' brains. Videos of the interactions will be coded for infants' smiling, gazing and testing behavior towards the adult experimenter. In a next step, we aim at analyzing phase locking values (PLVs), a measure for neural synchrony.

We predict stronger mu desynchronization in infants' single brains and increased brain-to-brain coupling (PLVs) between adult and infant in a condition in which the experimenter contingently imitates the infant's actions compared to a condition in which the experimenter performs a different action that is already in the infant's motor repertoire and a baseline condition. Our findings may reveal specific brain patterns associated with successful social interactions between adults and infants.

PB - 022 Delayed Theory of Mind Development in Children Born Preterm

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Children born preterm are at high risk of developmental delay in various cognitive domains. There is broad evidence indicating that preterm children show impairments in IQ, executive functions and language development. Moreover, problems in social interaction are more frequently reported in preterm children than in their full-term peers. These difficulties can be observed at two years of age and seem to persist until school age. Although closely linked to social acceptance, remarkably little research has focused on social-cognitive skills such as Theory of Mind in preterm children. The aim of the current study was to assess Theory-of-Mind development in preterm (n = 34) and full-term (n = 38) children over the course of two years. A Theory-of-Mind scale was administered at the children's age of 3, 4, and 5 years, and we additionally assessed and controlled for general cognitive development. The results revealed that preterm and full-term children differed in total Theory-of-Mind scores depending on the time of measurement. This interaction indicates that preterm children show a delay rather than a general deficit in Theory-of-Mind development. By the age of 5, their performance was similar to that of full-term children. Mechanisms underlying this course of development are still unknown. To examine why problems in social interaction persist despite improving Theory-of-Mind abilities, future research should extend the focus to implicit mental reasoning in preterm children.

PB - 023 Components of Pupillary Response during Visual Orienting Task Predict Focused Attention during Interactions of 8-month-olds

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From birth, infants learn to voluntarily focus on objects of interest and to grasp and explore objects around them proficiently (Ruff & Rothbart, 2001). These improvements in attention control coupled with growing abilities to move independently lead to better attention in social situations (Mundy et al., 2007). Recently, Elison et al., (2013) suggested that the period prior to 9 months of age is marked by a reorganisation of attention networks at the neural level, but the process has not been fully explored in detail. Here, we used eye-tracking to measure individual differences in attention network activity and its relation to infant spontaneous behaviour during interactions.

We used Principal Component Analysis (PCA) of pupillary data (PD) during an adapted Attention Network Test (ANT, Geva et al., 2013) and extracted two components, here interpreted as reflecting the separable influences of the alerting and the orienting networks, that explained nearly 100% of variance in PD. Within the session, we also manually coded the percentage of time that infants spent in episodes of either focused or casual attention (Ruff, 1986) during infant-parent interactions (final sample size was n=19).

We found that only the second PCA component from the spatial cueing condition of the task (likely reflecting the orienting network) explained ~30% of variance in the coded duration of focused attention. It suggests that individual differences in the activity of attention networks can be reliably measured with pupillary indices and that these differences are closely related to the distribution of attention during unconstrained social interactions.

PB - 024 Children reassess an informant's misleading claim in the light of later empirical evidence

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When learning about the world, children gather information from firsthand observation and from other people. The information gained from these different sources may sometimes converge, but at other times it may conflict. When it conflicts, children must engage in a weighing process and determine which source to trust.

Although children have a strong bias to trust an informant's testimony as a reliable source of information, children around 4-5 years of age show an emerging ability to engage in prospective revisions of trust and disregard an informant's claim when it conflicts with their prior knowledge. An unexplored issue is whether children are able to engage in similar weighing decisions retrospectively, i.e., whether they are able to revise a prior decision to trust an informant's claim when this conflicts with more recently acquired evidence.

Providing children (N = 107, Age range = 34-60 months) with a testimonial claim prior to their acquisition of first-hand data, the majority of children exposed to an unreliable informant shifted from relying on knowledge gained through the informant's testimony to relying on knowledge gained from physical evidence (75%). This shift that was significantly greater than that observed among children in the reliable condition.

This finding shows that children are not only able to make prospective, but also retrospective revisions of trust, and that they are able to do so at a younger age than is typically found for revisions of prospective trust.

POSTER SESSION B
FRIDAY

PB.e - 025 Bio-Behavioural Synchrony during Caregiver-Child Problem-Solving

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At preschool age balanced turn-taking is associated with behavioural and physiological synchrony during mother-child interactions (Harrist & Waugh, 2002). With the recent advancements in hyper-scanning the interpersonal coupling of brain activity is discussed as a neural underpinning of bio-behavioural synchrony (Atzil et al., 2014).

Here we present a dual functional near-infrared spectroscopy (fNIRS) study looking at the relationship between the quality of mother-child interaction during a problem-solving task and neural synchrony. Our sample consisted of 42 dyads of mothers and children aged 5 to 6 years. Wavelet transform coherence (WTC) was used to assess the cross-correlation between the two fNIRS time series. For statistical analyses, WTC values were entered as the dependent variable in a linear mixed effects model with condition (cooperation vs. individual vs. rest) and region (frontal or temporal) as fixed factors, and dyads as random intercepts. Results revealed a main effect of condition due to increased coherence in frontal and temporal areas during the collaboration, $t(2566)=3.77-4.47$, $p<.001$. Testing the hypothesis that neural synchrony facilitated task performance, coherence during collaboration indeed predicted the number of templates solved, $t=1.95$, $p=.05$. However, task performance was also predicted by coherence during rest, $t=2.80$, $p=.005$. Looking at the quality of mother-child interaction, mutual task engagement predicted coherence during the collaboration condition, $F(1,35)=5.60$, $p=.02$. The findings indicate that equal task engagement of mother and child may facilitate neural synchrony and highlight the complexity of neuro-behavioural synchronization between mother and child. The study will be complemented with a related investigation testing father-child neural synchrony.

PB.e - 026 Effects of social comparisons on human and nonhuman primates' task performance

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Social comparisons are a fundamental feature of human thinking and affect selfevaluations and task performance. Not much is known yet regarding the extent to which other species use social comparisons to navigate complex social environments or if this capacity is uniquely human and tightly linked to our self-consciousness. To investigate the evolutionary roots of social comparisons, we conducted a series of experiments, in which we presented different tasks and co-action contexts to human participants and long-tailed macaques (*Macaca fascicularis*). Specifically, we addressed the influence of comparison standard, competition and task complexity on task performance in the two groups. We found that our human participants assimilated their task performance to the perfor-

mance of a better or worse performing co-actor in one of two simple manual tasks but not in a more complex picture categorization task; they were similarly affected in competitive and noncompetitive conditions. In contrast, competition and task relevance was key for the monkeys: They increased task performance in a simple manual task when the partner's actions were potentially consequential for food availability but they were not affected by a co-actor in a non-competitive picture discrimination task. We suggest that monkeys consider how they fare in relation to others only in immediately competitive situations. In contrast, humans are in addition evaluating how their own performance compares to those of others in the absence of direct competition, for example in evaluative situations or out of social motivations such as conforming to group norms.

PB - 027 Assessing caregiver's touch: a comparison of measures

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Recent years have seen an increase in scientific interest in the sense of touch. However, compared with vision and hearing, touch is an especially difficult sense to study. Specifically, researchers interested in the relation between tactile stimulation provided by caregivers and various aspects of their babies' development have employed several different measures of touch, the validity and reliability of which have not been thoroughly investigated. Few studies have used more than one measure of caregivers' touch, making comparisons between results of different studies difficult.

In our study, we asked primary caregivers of babies aged 6 – 8 (n = 30) and 11 – 13 (n = 30) months to engage in a 10-minutes long free play session with their children, which was filmed and later coded for touch events. Moreover, the caregivers were also asked to complete the Parent-Infant Caregiving Touch Scale (Koukounari et al., 2015) as well as to fill in a custom online touch diary, registering their caregiving behaviours daily for a week. The poster presents a comparison of these measures and a discussion on what might have driven the observed relations.

PB - 028 The sensitive period for associative learning of non-adjacent dependencies: an ERP-study

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Grammatical dependencies between non-adjacent elements are important building blocks of language. For example, the sentence “The sister is singing” requires listeners to track grammatical

relations between the non-adjacent elements “is” and “-ing”. Recent event-related potential (ERP) studies revealed that 4-month-olds can learn these non-adjacent dependencies (NADs) under passive listening, while adults only learn under active task conditions (Friederici, Mueller, & Oberecker, 2011; Mueller, Oberecker, & Friederici, 2009). We therefore propose a developmental shift from infants’ effortless learning of NADs to adults’ effortful learning. To test when this shift occurs, we familiarized 12-, 24-, and 36-month-old children with Italian sentences containing NADs (e.g. “La sorella sta cantando”; The sister is singing) and then tested them with both familiarized and unfamiliar examples (containing a NAD violation, e.g. “*La sorella sta cantare”; *The sister is sing). To test whether this developmental shift is specific to language, we also familiarized and tested children with tone sequences containing NADs. Differences between ERP responses to familiarized and unfamiliar sentences reveal learning of the underlying NADs for 12- and 24-month-olds in the linguistic domain, while 36-month-olds, similarly to adults, did not learn under passive listening conditions. In the non-linguistic domain, we found no evidence for NAD learning. NAD learning thus seems to show a language-specific developmental shift between the age of 24 and 36 months. These data are in line with a recent neurocognitive model suggesting the age of three years as a turning point from infant-like associative to adult-like more controlled processes (Skeide & Friederici, 2016).

PB - 029 Infants representation of causal relations: A pupillometry study.

Parvaneh Adibpour, Jean-Rémy Hochmann

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Detection of causal relationships between events is essential to our understanding of the environment and acting on it. Tracking down the developmental origins of this ability can thus unveil the early building blocks of our tool-use or decision-making abilities.

Here, we explore the use of pupillometry to study 8-months-olds’ representation of causal events as a methodological alternative to classical looking-time paradigms. Infants watched 50 short video clips similar to Michottian launching events. In frequent familiarization trials a first ball moved behind an occluder and gave the impression of causing the movement of a partially visible second ball. In interleaved rare test trials, the occluder was absent and the variation of the pupil diameter was assessed in response to two types of events: a “contact event” in which the second ball started moving upon a collision by the first ball; and a “gap event” in which the second ball started moving even though the first ball stopped before reaching it. Infants’ pupil diameter increased more in the latter than the former scenario. Such pupil dilation is taken to reflect surprise, suggesting that infants interpreted occluded events as contact causal events, as previously suggested by looking time studies. This observation shows that pupil dilation can index infants’ expectations about causal relations at 8 months, opening new avenues for studying infants’ cognitive abilities. We will discuss the advantages and caveats of this method compared to looking-time paradigms.

PB - 030 Learning to construct sentences in Spanish: a replication of the Weird Word Order technique

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Children start to productively combine words into sentences around their second birthday. Two opposing positions have been adopted in the explanation of this learning process: the Syntactic Bootstrapping account (Gleitman, 1990; Naigles, 1996); probabilistic learning mechanisms linked to frequent items (Ambridge, Kidd, Rowland and Theakston, 2015). In order to shed light on this debate, authors have trained two- and three-year-old children to use atypical word orders –i.e. the weird word order (WVO) in the past. We have applied the same technique in Spanish, a language that allows for more variability in the positions of subjects and objects, with respect to verbs, than other previously studied languages (English, French and Japanese). As in prior studies (Abbot-Smith et al., 2001; Matthews et al., 2005, 2007; Chang et al., 2009; Franck et al., 2011), we have manipulated the relative frequency of verbs in training sessions with two age groups (3 and 4-year-old children). Results support earlier findings: children produce atypical word order significantly more often with infrequent verbs ($M=0.45$; $SE=0.05$) than with higher frequency verbs ($M=0.16$; $SE=0.05$) ($F(1,67)=16.82$; $p<0.001$; $\eta^2=0.20$). They also provide the typical (Subject- Verb-Object) order significantly more often with frequent verbs, although the effects for age are less clear. These results support probabilistic learning models, which allow higher levels of flexibility and, alternatively, oppose hypotheses that defend early access to advanced grammatical knowledge.

PB - 031 Does Adult-Infant Play Facilitate Infant Category Learning?

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Caregivers' actions enable infants to engage in observational learning and be exposed to category labels (Althaus & Plunkett, 2015; Ferry et al., 2010). However, we lack research on naturalistic adult-infant play and how it may facilitate category learning. In an ongoing study, we compare infant category learning in two conditions: free play and guided play with a caregiver.

We asked two questions: 1) Do infants learn categories better in guided play than they do when playing alone?; and 2) What do adults do that might facilitate category learning in infancy?

To date, in a within-subjects design, thirteen dyads (infants aged 11 to 13.8 months) have engaged in free (solo) play and guided play with familiar category toys (e.g., animals), and with novel category toys (created for the study). Category learning was assessed using a novelty preference post-test, as in Waxman and Markow (1995).

Interim results show that category learning was stronger in guided play than in free play for novel categories, $t = -2.46$, $p = .03$, but not familiar categories, $t = -0.28$, $p = .78$. Caregiver use of the category label was related to category learning with novel categories, $r_s = .66$, $p = .04$, but not familiar categories, $r_s = .35$, $p = .30$.

These exciting preliminary results suggest that play with caregivers may contribute to infants' novel category acquisition, a crucial component of early cognitive development.

PB - 032 Non-verbal lying in three year olds: An interaction-based experiment to measure spontaneous lying in children

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Previous research suggests that intentional lying and false belief implementation emerges around the age of 4 years (e.g. Evans & Lee, 2013). All paradigms measuring lie-telling and deception, however, are based on verbal descriptions and typically elicit lying in response to verbal questions or direct instructions (e.g. temptation-resistance-paradigms) which might impair children's deceptive abilities (Rubio-Fernández & Geurts, 2016).

Therefore, we developed a new interaction-based paradigm to shed light on spontaneous, nonverbal lying and false belief implementation in 3-year-old children. In an interactive puppet play either an enemy (bear) or a friend (frog) searched for a hidden sticker while the protagonist was temporarily absent. In a 2x2 between-subject design we further manipulated the motivation and personal relevance to lie (egocentric condition vs. prosocial condition). Additionally, we tested for underlying cognitive processes with false belief, knowledge-ignorance and inhibition tasks as well as for social factors (e.g. parental style, siblings) and daily use of lying with questionnaires. Data collection is ongoing (current $N = 76$, planned $N = 80$).

Current results indicate more lying in the enemy than in the friend condition with no difference between egocentric and prosocial motivation and about half of the sample lying at least once, suggesting that some children younger than 4 years are already able to spontaneously implant false beliefs in others. Overall, this study will contribute to a deeper and comprehensive insight into children's developing understanding and spontaneous manipulation of other's mental states.

PB - 033 The development of conceptual perspective taking

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Thinking about an object in multiple ways puts multiple conceptual perspectives on it, e.g., Susi's mother and Anne's teacher can be the same person. Three-year-olds have problems dealing with different conceptual perspectives and these problems relate to their problems understanding dif-

ferent mental perspectives of others. In this study we investigate whether using different labels for a visually continuously present object leads to different ways of thinking about the same object. We presented 47 3- to 6-year-old children four stories – two each in the change-condition and the same-condition – in which we used cartoon characters with an identifiable profession (e.g. a rabbit that is a gardener), and two change-of-location false belief (FB) tasks. In the beginning, the gardener lost his wallet. Then the bear came along and – in the change-condition – the bear asked the rabbit for going to lunch. After lunch one of the two could not pay, the child was asked then: “Who cannot pay? The rabbit or the bear?” In the same-condition, the description for the main character was the same during the entire story. FB- had great difficulty with the change-condition, while easily mastering the same-condition. The performance in the FB+ group was equally good in both. Our data show that indeed different labels applied to an object create different ways of thinking about it, such that information gained under one way is not available when thinking under the other way. This problem with different conceptual perspectives persists until children understand others’ mental perspectives.

PB.e - 034 A new method for examining visual working memory in two-year-olds

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Visual working memory (visual WM) allows us to flexibly combine pieces of visual input to briefly maintain representations of the world. While visual WM has been studied in infancy (Kibbe, 2015), childhood (Cowan, 2016), and adulthood (Brady et al., 2011), few studies have examined visual WM in toddlerhood. We created a visual WM task designed to address this gap by examining multiple components of visual WM in two-year-olds.

On each trial, two or three different colored beads were hidden in separate locations. In Experiment 1, beads were hidden sequentially to examine updating and binding processes. In Experiment 2, beads were hidden simultaneously to examine encoding and maintenance processes. We then showed toddlers a color card and asked them to select the location of the bead that matched the color card. Eighteen toddlers (M=35.6 months, SD=4.25) participated in Experiment 1. When beads were hidden sequentially, toddlers chose the correct location at rates significantly above chance for both Set Sizes ($p < 0.05$), but toddlers’ success varied as a function of serial hiding order: for both Set Sizes, toddlers were above chance for both the last-hidden and first-hidden objects. However, at Set Size 3, toddlers were below chance for the middle-hidden object. Preliminary data has been collected on 9 toddlers (M=33.96, SD=3.95) in Experiment 2. Together, results suggest a limit of “two objects for feature-location-bound object recall in visual WM in toddlers, and reveal insights into how information is maintained in visual WM during an active object-tracking task in an understudied population.

PB.e - 035 Infants do not understand helping as a second-order goal

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Despite recent interest in infants' abilities to reason about helpful behaviors, it is poorly understood what their helping concept precisely entails. Helping can be described as an action having the second-order goal of reducing the helpee's costs of goal completion.

We conducted a looking-time study to investigate whether this is how infants understand helping. During some familiarization trials, 12-month-old infants ($n = 24$) were shown one agent (Helpee) taking a long path towards a target, due to a short one being obstructed. In other familiarization trials, a different character (Helper) removed the block obstructing the short path, allowing the Helpee to approach the target through it. At test, infants were shown the Helper either pushing a block obstructing the short path, allowing the Helpee to take a direct route to the target (consistent outcome) or pushing another block not in the way of the Helpee (inconsistent outcome). Participants' looking time did not discriminate between the two test events.

To check whether infants attributed to the Helpee the goal of approaching the target, we ran a control study ($n = 24$) with the same familiarization. At test, the Helper acted helpfully in both outcomes, but the Helpee approached the object through either the shorter or the longer path. The infants looked longer to the latter outcome.

These findings suggest that infants may not be able to represent the second-order goal of helping solely on the basis of whether an agent's action can be construed as reducing costs for the Helpee.

PB - 036 Improving transfer of inductive rules through familiar names in adults and children

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Inductive reasoning involves making predictions about novel objects or situations based on existing knowledge. Recent research showed that using verbalization when solving category induction tasks ("Bongard problems") enhanced task solution transfer to similar tasks in comparison with solving tasks tacitly (Sulic, Lupyan, 2018). The present study examined the naming factor that facilitate the learning and transfer of inductive rules knowledge. We manipulated the language with which children and adults were exposed to novel rules during training. In abstract condition participants saw 18 problems which rules were formulated in geometric terms (e.g., 'Similar figures'/'Not similar figures') and defined which set of instances refer to. In concrete condition the same problems were presented with rules formulated in familiar words (e.g. 'Figures reflect in the mirror'/'Figures do not reflect in the mirror'). Test phase included similar problems but with new instances, so participants should transfer the rules they learn earlier. We found that adults and 10-year-old children in concrete condition performed better in transfer task. There were no difference between concrete and

abstract conditions amongst 7-year-olds. It seems that the use of more concrete language directed adult's and older children's attention to the better memory during recognizing novel instances of inductive rules. The research was prepared within the framework of the Academic Fund Program at the National Research University Higher School of Economics (HSE) in 2018 (grant N° 18-05-0001) and by the Russian Academic Excellence Project "5-100".

PB - 037 Selective trust, accessibility and ascription of traits – Comparing children with adults under limited cognitive resources

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Recent research suggests that preschoolers employ different cognitive strategies in their selective trust decisions as a function of context and task demands (Hermes et al., 2018): sometimes they use rational, trait-based strategies, preferring those models with the most relevant competences. Yet, at other times they use heuristic strategies, preferring the somehow 'better' models even for unrelated tasks. Here, we directly tested predictions of the dual-process account in children and adults. First, we tested whether children engage in heuristic reasoning, preferring a model scoring high on the most accessible trait even when that trait is not predictive for the specific task. Second, we explored whether adults solve such tasks more rationally based on the models' relevant traits and whether, under cognitive load, they fall back on heuristic reasoning. Children (N=58, age: 49-79 months) and adults (N=90) were familiarized with videos of two models, indicating information about their strength (high-accessibility trait) and extraversion (low-accessibility trait). Both were competent in one domain and incompetent in the other (strong-and-shy / weak-and-extraverted). In test trials, participants chose between the models in strength- and extraversion-related tasks. As cognitive load manipulation, half of the adult sample simultaneously performed an n-back task. Results show that children rationally chose the model scoring higher on the relevant trait. For extraversion tasks this was solely driven by those children who subsequently ascribed the trait successfully, confirming the role of trait ascription in children's selective trust. Adult data collection is ongoing and will help address the question of the heuristic processes involved.

POSTER SESSION B
FRIDAY

PB - 038 The role of intentions and conceptual understanding in symbolic reasoning

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DeLoache (2004) claims that the meaning of a symbol comes not just from what it is, but also from what it is intended to be. Previous work shows that preschoolers track the intentions of symbol-makers when interpreting symbols. For example, Bloom & Markson (1998) had 3- to 4-year-olds

draw a lollipop on one paper and a balloon on another -- predictably, children's drawings of these two items looked very similar (a circle with a line). Children then had to "find the lollipop", and did so at above-chance levels. In Exp. 1 ($n=89$), we replicate this finding (77% success at identifying the 'lollipop'). In Exp. 2 ($n = 77$) we ask about the content of the intended meaning of drawings. By one view, children track the intended referent of a symbol by mentally relating symbols to words (e.g., this picture is 'lollipop,'); another view is that they instead mentally relate each symbol to a concept (e.g., this picture is [lollipop]). To test this, children were assigned to draw similar concepts (baby cat / kitten) or different concepts (baby cat / old cat). If children map drawings onto words, they should be equally good at identifying the referent in both conditions (since drawings were requested using different words in both conditions). If children map drawings onto concepts, they should be better at identifying the referent in the different concepts condition than the similar concepts conditions; this is precisely what we found ($d = .10$). Implications for symbolic development will be discussed.

PB - 039 Exploratory, cross-domain investigations into the nature, origin, and time-course of concepts of infinity

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While acquiring numerical competence, children develop beliefs about infinite sets and the recursive procedures that generate them. The generative knowledge that the natural numbers are infinite is simple, explicit, and learned between the ages of 5 ½ and 6 (Cheung, et al, 2017). Such knowledge plausibly informs beliefs about infinity in other conceptual domains, like space and time. To test this, we recruited children between the ages of 4-8 (target $n = 100$), and surveyed their beliefs about infinity in space, time, and number. Children responded to forced-choice, binary questions allowing us to classify children as having (A) the belief that a given domain is recursively and indefinitely extensible; (B) the belief that a given domain is infinite; (C) both; or (D) neither. To determine the time-course of the acquisition of infinity knowledge, children were classified per domain, and we identified the mean age of acquisition per domain separately. Similarly, comparing classification groups across age, we investigated whether belief (A) regularly precedes belief (B) in the development of infinity knowledge within a given domain. Children also performed a battery of number-competence tests indexing their grasp of productive counting rules, their comprehension of cardinality, and their knowledge of the recursive successor function, and which provided data to investigate the possibility of a predictive relationship between general numerical ability and knowledge of numerical infinity.

PB - 040 The development of gender stereotypes across the developmental timespan

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There is substantial evidence that both adults (Rudman et al., 2012) and very young children (Sullivan et al., 2018) experience penalties when they violate gender stereotypes. In order to understand the source of gender backlash, it is important to first understand both the nature of gender stereotypes about children across the developmental timeline. To achieve this, we tested 4,257 adults' beliefs about gender stereotypes. Participants rated a list of characteristics that were attributed to a target; our critical manipulation was target-gender (boy vs. girl) and target age (1 year, 4, 7, 10, 13, 16, or adult). Half of all participants were asked to rate the typicality of each characteristic (to assess descriptive stereotypes) and half were asked to rate the desirability of the characteristics (to assess pre- and proscriptive stereotypes). We present the first normed list of gender stereotyped characteristics about children across the developmental timespan. We show that some characteristics are consistently ungendered (e.g., challenges authority, self-centered, waits their turn), others that remain consistent across the developmental timespan (applying even to 1-year-olds, e.g., boys are dirty; girls don't use harsh language), and still others for which the gender-stereotypes change over development (e.g., girls at some ages are adorable and affectionate; boys at some ages are rowdy and fearless). Implications for social development are discussed.

PB - 041 Does the latency before an action predict how controlled the behavior is?

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In the current study, 5- and 6-year-olds completed two metacognitive control tasks. In the visual discrimination task, children had to recognize pixelated pictures. In the paired associate task, children learned pairs of pictures, which they had to recognize in a later test. In both tasks, before the recognition test phase, an opt-out phase was presented to measure control behavior. In this opt-out phase, for each picture/pair, children choose whether they wanted to answer or not (accept or reject an item). Results revealed that in both tasks, 5- and 6-year-olds were able to control their behavior (i.e., accuracy of recognition was significantly higher for accepted compared to rejected items). Also, they performed better at controlling their behavior in the discrimination task than in the paired associate task. Moreover, in both tasks, 6-year-olds were better at controlling their behavior than 5-year-olds. Reaction times of the opt-out phase revealed that only in the discrimination task, children's latency of control behavior was longer for rejected compared to accepted items. Because we finished data collection just now, data analysis is still ongoing: Gamma correlations will be calculated to investigate whether the response latency of the opt-out phase can predict the control behavior. In conclusion, results reveal that control behavior still develops in the investigated age range and is strongly task dependent, a factor that has been widely overlooked in the metacognitive literature.

PB - 042 Developmental study of the mid-frontal theta power involvement in cognitive control during childhood

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This study aimed at understanding the role of mid-frontal theta as measured by EEG on cognitive control performance in young (4-6 years old) and older children (6-8 years old). The task consisted of different types of interference that required an engagement of cognitive control. The interference was either due to the two conflicting response alternatives elicited by the two stimulus dimensions and/or due to the change in trial-to-trial stimulus-response mapping. A multivariate analysis approach was used to isolate mid-frontal theta component and generalized linear mixed models were used to assess the relationship between mid-frontal theta and trial-by-trial behaviour. Behaviourally, older children performed similarly on trials with interference between the response alternatives as compared to the trials without. However, they were less accurate and slower on trials with changes in stimulus-response mapping as compared to trials without such changes. Younger children were slower and less accurate for both types of interference. These results demonstrate that the interference control between response alternatives improved between the ages of 4 and 8 years, while the interference control between stimulus-response mappings did not. EEG analyses revealed that in younger children midfrontal theta power was increased for the trials with an interference between stimulus-response mappings. Furthermore, while global response times were partially explained by mid-frontal theta power for all children, a relation between theta activity and response times in interference trials was only found for younger children. These results highlight the complex role of theta activity in the development of interference-related executive processing.

PB - 043 Ostensive signals contribute to the segmentation of actions in toddlers

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Ostensive signals such as direct gaze and infant-directed speech denote pedagogical contexts. Additionally, ostensive signals may also provide structural information. Parents use ostensive signals such as direct gaze particularly at event boundaries (Brand, Hollenbeck, & Kominsky, 2013; Brand, Shallcross, Sabatos, & Massie, 2007). We investigated whether ostensive signals can help to segment action sequences and change children's imitation of the actions using a paradigm by

Carpenter, Call, and Tomasello (2005): When an experimenter moved an animal in a hopping or sliding movement, infants were less likely to imitate the manner when they were shown the animal go into a house, compared to when they saw the action being performed on its own. It is possible that children perceived the action manner and outcome as part of a single action. In the current study, we investigated whether addressing toddlers with a short “Wow” and direct gaze after the hopping/sliding, but before putting the animal into the house (boundary marked) poises them to perceive both actions as separate and increases their manner imitation. A control group was addressed after the animal was put in the house (boundary unmarked).

For the salient hopping action, marking the boundary between action manner and outcome did not increase imitation. However, for the less salient sliding action, marking the boundary increased imitation considerably. These results highlight the complex relationship between actions, salience and ostensive signals during pedagogical interactions and suggest that ostensive signals can contribute structural information to segment actions.

PB.e - 045 An Inflection Point in Toddlerhood for Asymmetric Spatial Biases

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We examined the age at which left-to-right spatial associations found in infancy shift to culture-specific spatial biases, for both numerical and non-numerical information. 149 children (49 1 y.o.s, 35 2s, 33 3s, and 34 preschoolers) were tested using an eye-tracker while viewing a video of a spatial transposition task. During four trials, one object was hidden in a consistent location within a vertical array comprising five locations. On a final trial, the array was covered with an occluder, surreptitiously rotated 90o, and uncovered. The narrator prompted the child to visually search for the object during a 5-second delay. Participants were assigned to either the Numbered condition (in which the narrator labeled each of the locations with 1, 2, 3, 4, or 5 during vertical training) or Labeled condition (the locations were labeled as Dax, Zif, Blick, Mot, or Wug). A measure of the children’s counting direction was also taken.

1-year-olds and preschoolers exhibited more frequent fixations to locations corresponding to a left-to-right (LR) spatial mapping after the array is transposed, relative to a right-to-left (RL) spatial mapping. Toddlers did not. Further, preschoolers preferred this LR spatial mapping for the Numbered – but not Labeled – condition. LR counters in particular were more likely than RL counters to demonstrate LR mappings in the Labeled condition. This experiment supports the theory that toddlers are temporarily spatially ‘agnostic’, exhibiting no directional bias while absorbing cultural spatial norms. It also suggests that counting behavior modulates our spatial-numerical biases once they re-emerge from this agnostic period.

PB - 046 Why did you break a commitment? Three-year-olds' sensitivity to appropriate motives behind a commitment failure

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Commitments create obligations, but the precise scope of commitments can never fully be made explicit. For instance, we expect someone to be released from her commitment anytime this conflicts with a weightier moral consideration (Shpall, 2014). Previous research has shown that 3-year-old children not only have an understanding of the obligations entailed by commitments (Gräfenhain et al., 2009; Hamann et al., 2012), they also distinguish between instances in which a partner fails to make a contribution intentionally and instances in which she fails to do so for external reasons or out of incompetence (Kachel et al., 2018). But are children at that age also able to assess the legitimacy of reasons why agents may intentionally refrain from acting in accordance with commitments? To probe this, we manipulate the kind of reason that leads a partner to break a commitment. In the main task, three-year-old children play a game with a puppet in order to obtain rewards. In two different conditions, the game is interrupted by the partner either because (a) the partner has been allured to play another tempting game; or (b) the partner consoles another agent in distress. We predict that three-year-old children differentiate between these two cases, protesting normatively against defection and being less willing to wait when the joint activity is interrupted because of another tempting game. These results would suggest that 3-year-old children are competent in making appropriate normative evaluations of the scope of commitments.

PB - 047 The role of attention in visual perception and how it is represented by social agents in social agents

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Research on PT has been largely isolated from the context provided by the actual mind to which the perspective is attributed. A trend towards change can be seen in theories highlighting the significance of the protagonist's permanent features, like social group membership (Westra, 2017), or personality and cognitive functions (Conway, Catmur, & Bird, 2018). We propose that humans may also learn to use context dependent features, like the partner's inferred attentional focus, to improve the success of mentalizing. Due to capacity constraints, only a fraction of all information present in one's visual field will ever reach the level of conscious perception. Attention is the cognitive process that prioritizes the cortical processing of some information over others, largely determining what will become conscious visual experience. While research on social cognition equates "attending" with "gazing", attention (consequently seeing) can dissociate from fixation as demonstrated by

covert attention and inattentive blindness. There is no direct link between being exposed to certain information and perceiving them, which poses a great challenge for the mindreader. What does the partner see amongst all accessible detail? Crucially for the mindreader, selectivity has its rules, which, if understood, can be used to compute what the partner has an experience of seeing. As top-down attention serves the accentuated processing of goal-relevant information, a tacit understanding of how attention modulates perception supplemented by the ability to monitor what types of information are currently goal-relevant/attended by a social partner can serve as a key to the partner's mental representations.

PB - 048 Contrasting the roles of task selection and task execution in cognitive control development using the double registration procedure

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Emerging cognitive control predicts various later life outcomes. Although prior research has mostly focused on task execution, recent findings have highlighted the key role of task selection in cognitive control development. Here, we directly compared task selection and task execution using the double registration procedure in an alternating run task-switching paradigm. 7-8 years olds and 10-11-years-olds sorted switched between colour- and shape-matching tasks as a function of an alternating rule (consisting in switching tasks every other trial). The double registration procedure required children to first select the relevant task before actually executing the task, hence temporally separating task selection and task execution. In addition, we also manipulated the self-directedness of task selection by either explicitly teaching children the alternating rule or letting them infer it from feedback. We expected this manipulation to influence task selection but not task execution, hence further speaking to the separability of these two processes. Results showed that mixing and switch costs were greater for task selection than task execution, especially in younger children. Furthermore, having to infer the rule specifically increased the costs associated with task selection. These findings speak to the distinction between task selection and task execution and suggest that improvement in task selection drives cognitive control development to a greater extent than improvement in task execution.

PB - 049 In touch with your body: Does affective touch help infants to detect body-related multi sensory synchrony?

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The present study aims to investigate whether affective touch modulates body-related multisensory processing in infancy. Touch provides information about the external object touching our skin and at the same time about our body itself. In particular, affective touch, caress-like touch linked to C-Tactile

afferents, activates the posterior insula, which is involved in multisensory body perception. This suggests affective touch may have a crucial role in the development of body awareness. Five-month-old infants were presented with two side-by-side videos representing a baby's face been stroked on the forehead, one delayed by three seconds. Infants were stroked on the forehead and these touches were synchronous with one video and asynchronous with the other. We considered the touch velocity (CT-optimal vs fast touch) as within-subject condition and the source of touch (hand vs brush) as between-subject condition. Contrary to previous studies that showed evidence of infants' ability to detect intersensory synchrony, our results revealed that infants looked for a similar amount of time at both synchronous and asynchronous videos, regardless of touch velocity and source of touch. Compared to previous studies, we extended the length of touch in order to differentiate the two touch velocities. Thus, the visual movement resulted more salient and it may have captured infants' visual attention independently of the tactile stimulation. In particular, biological movement of the hand attracted infants' attention more than the brush. Future studies should investigate whether affective touch may help infants to detect a body-related visual contingent stimulus when there is no movement distractor.

PB - 050 Persistent and non-persistent behaviour in kindergarten children

Niamh Oeri, Sonja Kälin, David Buttelmann

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While some children persist in the face of a challenge, others do not – why? Longitudinal research has shown that persistence is related to social as well as academic skills. However, little is known about the underlying processes of persistence. The aim of the present study was two-fold: Firstly, we wanted to shed light on processes that may be underlying persistent behaviour. Secondly, we aimed to explore whether different qualities of non-persistent behaviour can be distinguished. In a sample of 155 kindergarten children (mean age: 5 years 9 months) persistence was assessed with an unsolvable puzzle task. In addition, executive functions and temperament were assessed. Results showed that beyond temperament ($\beta = -.22$), cognitive inhibition ($\beta = .24$) and cognitive flexibility ($\beta = .17$) predicted persistence ($F(4, 155) = 9.15, R^2 = .19$). Analyses of non-persistent behaviour revealed two distinct qualities: cheating (i.e., solving the task not according to the rules) and off-task behaviour (i.e., all behaviour unrelated to the task). For off-task behaviour, age was ($\beta = -.21$) the only significant predictor ($F(4, 155) = 6.08, R^2 = .14$). For cheating ($F(4, 155) = 6.14, R^2 = .17$), however, cognitive inhibition ($\beta = -.19$) and cognitive flexibility ($\beta = -.19$) were significant predictors, beyond temperament ($\beta = -.09$). The present results suggest that cognitive skills such as inhibition and flexibility may belong to the underlying cognitive processes involved in persistent behaviour and that there seem to be different qualities of non-persistent behaviours with distinct underlying processes.

PB - 051 Social Information Use and Cultural Diversity in VanuatuAnne Sibilsky¹, Heidi Colleran², Daniel Haun¹¹Leipzig Research Center for Early Child Development, Leipzig, Germany; ²Max Planck Institute for the Science of Human History, Department of Linguistic and Cultural Evolution

How children use information of their peers has far-reaching consequences beyond the individual level: Henrich and Boyd (1998) proposed that the way in which people learn from others may have a crucial influence on the maintenance of similarities within and differences between cultural groups. The current study investigated social learning, and its role in shaping societies, in children from 5 different populations in Vanuatu.

We tested 280 children aged between 5 and 12 years using a validated social learning task (see Haun, Rekers & Tomasello, 2012 and van Leeuwen et al., 2018). Children watched a movie with different numbers of demonstrators using different openings of a box that delivers a toy. We assessed participants' behavior when approaching the box and examined their preference for social information (vs. innovation) and whether they tend to follow a majority or a minority of demonstrators. Preliminary results show within-cultural and age-related variation in social information use and majority bias. We will discuss our results from three different angles: a) in reference to results of the same paradigm in 7 other societies (van Leeuwen et al., 2018), b) in reference to a previous study on conformity in Vanuatu conducted in 2017, and c) in an intracultural comparison by studying the relationship of social information use and diversity within a particular village and the relationship of social information use and diversity between villages.

PB.e - 052 Do preverbal infants expect group members to pursue goals by the same inefficient means-actions?Nazli Altinok¹, Mikolaj Hernik¹, Ildiko Kiraly^{1,2}, Gyorgy Gergely¹¹Cognitive Development Center, Central European University; ²Eötvös Loránd University

Infants expect agents to act efficiently (Gergely et al., 1996). They also expect individuals belonging to the same group to behave alike (Powell & Spelke, 2012). However, we know little about how these two tendencies interact. We hypothesize that upon viewing individuals from the same group approaching a goal-object inefficiently, infants could represent this action as a group-specific means-action and expect other group-members (but not agents from a different group) to approach the goal in the same manner despite inefficiency.

Experiment 1 aimed at validating our stimuli as conducive to teleological inferences in 11-month-olds. We showed infants scenes with three "ingroup" agents and one "outgroup" agent based on familiarization events by Powell and Spelke (2012). We also familiarized infants with efficient actions of one ingroup agent detouring a long barrier to obtain the goal. At test the barrier was shorter and didn't block direct access to the goal, thus rendering the detour-action inefficient. On alternate test-trials infants watched the familiarization-agent now taking direct path to the goal (efficient trial) or the old

detour-path (inefficient trial). Infants looked longer at the inefficient test trials ($t(23) = 2.185, p = .04$), replicating the previous findings. The procedure for Experiment 2 differed only in that infants were familiarized to inefficient detour-approaches of two ingroup agents and watched actions of a third ingroup agent at test. We predict that if infants represent the inefficient detour as a means-action shared within the group they should look longer at the efficient test trials.

PB - 053 The impact of coordinated movement and ostensive cues on young children's commitment to joint action.

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Commitments are important in social life. Previous research has revealed a basic understanding of joint commitments by age 3 (e.g., Gräfenhain et al., 2009; Gräfenhain et al., 2013; Kachel et al., 2017). While these studies investigated commitments made verbally, recent studies have highlighted the importance of nonverbal cues to commitment, such as coordination (Michael et al., 2016;) and ostensive eye contact (Siposova et al., 2018; Wyman et al., 2012). There is a lack of research directly probing the development of children's sensitivity to such cues.

The current study addresses this gap by investigating the effects of non-verbal cues on young children's commitment to a joint activity in the absence of an explicit verbal commitment. In a between-subjects design with 3 conditions (N=90), we compare how 4-year-old children respond when their adult play partner either: A) ostensively coordinates their movements with the child during their joint activity; B) coordinate's non-ostensively; or C) does not coordinate with the child. We operationalize children's sense of commitment in terms of the verbal and nonverbal acknowledgement signs they exhibit when abandoning the joint activity to play an attractive alternative activity. In addition, we measure how many rounds of joint activity they complete before stopping.

Data collection is currently in progress. We will examine the effect of coordination and ostensive cues and the interaction between the two cues.

PB - 054 Exploring the representations of early logical reasoning: the power and limits of neural network models

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Recent results suggest that infants spontaneously use elementary logical inferences when passively exploring a scene [1,2]. The nature of the representations underlying these abilities is unknown. Here we begin studying the potential nature of such representations by simulating the same tasks that allegedly show early logical abilities. Our strategy is to apply Occam's razor and start by exploring the simplest possible architectures and representational structures, increasing their complexity only

when forced by the data. The simplest implementations we explore are Layer Recurrent Elman neural networks which contain no explicit logical rules. We implement them with one hidden layer, training them with backpropagation on the most elementary representation of the stimuli infants saw in the familiarization scenes of [1] and [2], and testing them on their test scenes. Our aim is to investigate whether a low-level perceptual account, naturally emerging from simple networks used in pattern recognition, suffices to account for early logical reasoning. The error at the test outputs suggests that such simple networks rapidly converge towards a solution, but this solution fails to reproduce infants' reactions to scenes containing potential logical inferences. We explore the psychologically plausible computational resources that can be added to the network so that it could simulate the experimental data available.

[1] Cesana-Arlotti, N., et al. (2018). *Science*, 359(6381), 1263-1266.

[2] Bohus, K. A., Martín Salguero, A., Cesana-Arlotti, N. & Bonatti, L. L., In preparation.



PC - 001 Exploring the structural neural background of body ownership

Timea Budai, Beatrix Lábadı, Nikolett Arató, Orsolya Inhof, Szabolcs Bandi, András Zsidó, Gergely Darnai, Kata Lénárd
Institute of Psychology, University of Pécs, Pécs, Hungary

PC - 002 Is the path or the goal more important? Effects of age in an imitation choice task

Lea Moersdorf, Moritz M. Daum, Alexandra M. Freund
Department of Psychology, University of Zurich, Zurich, Switzerland

PC - 003 Namable spatial features improve category learning in adults and children

Maria Zherdeva, Tatyana Kotova, Alexey Kotov
National Research University "Higher School of Economics", Moscow, Russia

PC - 004 Deception and Constructivist Theory of Mind in early school age

Melania Moldovan, Narcisa Prodan, Laura Visu-Petra
Developmental Psychology Lab, Department of Psychology, Babeş-Bolyai University, Cluj-Napoca, Romania

PC - 005 Highlighting an information gap influences children's exploration and learning

Eleanor Jordan, Christoph Völter & Amanda Seed
University of St Andrews

PC - 006 Children copy rationally when another communicative goal is a plausible explanation for inefficient action

Elisa Felsche¹, Christoph Voelter¹, Amanda Seed¹, Daphna Buchsbaum²
¹University of St Andrews, UK; ²University of Toronto, Canada

PC - 007 Testing Kindergarteners' Category Learning Strategies

Eszter Dóra Szabó^{1,2}, Krisztián Borbély^{1,2}, Vivien Wolf², Anett Ragó²
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PC - 008 A systematic replication of the interactive false belief Sefo-task

Lisa Wenzel¹, Sebastian Dörrenberg^{1,2}, Marina Proft¹, Ulf Liszkowski², Hannes Rakoczy¹
¹University of Göttingen, Germany; ²University of Hamburg, Germany

PC - 009 - The effect of ostensive communication on action pattern acquisitionCristina I. Galusca¹, Liuba Papeo^{2,3}, and Luca L. Bonatti^{1,4}¹Universitat Pompeu Fabra, Center for Brain and Cognition, Barcelona, Spain; ²CNRS Institut des Sciences Cognitives Marc Jeannerod; ³University Claude Bernard Lyon¹, France; ⁴ICREA, Pg. Lluís Companys 23, 08010 Barcelona, Spain**PC - 010 Between selective and exact imitation: 18 months-olds' performance in three types of imitation tasks**

Solveig Flatebø, Gabriella Óturai

Department of Psychology, UiT The Arctic University of Norway, Tromsø, Norway

PC.e - 011 Attributing ambiguous belief can influence first person information processing

Andrea Márta Hegedüs, Fruzsina Elekes, Katalin Oláh, Ildikó Király

Eötvös Loránd University, Budapest, Hungary

PC.e - 012 Prediction by logical inference at 19 monthsKinga Anna Bohus¹, Ana Martín Salguero¹, Nicoló Cesana-Arlotti², Luca L. Bonatti^{1,3}¹Center for Brain and Cognition, Universitat Pompeu Fabra, Barcelona, Spain; ²Department of Psychological and Brain Sciences, Johns Hopkins University, Baltimore, MD, USA; ³ICREA, Barcelona, Spain**PC - 013 Can infants use multiple cues in learning phonemes?**

Mihye Choi, Mohinish Shukla

University of Massachusetts Boston, Boston, MA, USA

PC - 014 Reidentifying objects by their place in space and time: the development of object-individuation in the second year of life.Gregor Kachel¹, Jan Lonnemann², Frauke Hildebrandt¹¹University of Applied Sciences Potsdam, Germany; ²University of Potsdam, Germany**PC - 017 Seeking out the majority: Preverbal expectations whether third parties will join the larger group**Oda Eidjar¹, Erik Kjos Fonn¹, Joakim Haugane Zahl¹, & Lotte Thomsen^{1,2}¹Department of Psychology. University of Oslo, Norway; ²Department of Political Science, Aarhus University, Denmark

PC - 018 Monolingual versus bilingual acquisition of discourse: Diversity in the development of macrostructure

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PC - 019 Can infants learn an arbitrary word for negation in a few trials at 5 months of age?

Milad Ekramnia, Ghislaine Dehaene

Developmental Neuroimaging Lab Unicog, Neurospin, Gif Sur Yvette, France

PC.e - 020 Linguistic versus inferential abilities in children's comprehension of speech acts

Andrea Balázs¹, Anna Babarczy²

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

PC.e - 021 French-English bilingual children's sensitivity to genericity and specificity: evidence of implicit and explicit knowledge

Coralie Herve

University of Essex

PC - 022 The Interrelations between Different Aspects of General Cognitive Abilities in Early Child Development

Jie Ren, Matt Hilton, Anne van der Kant, Barbara Höhle

University of Potsdam, Potsdam, Germany

PC - 023 Early production of metonymy

Josephine Bowerman, Nausicaa Pouscoulous

University College London, UK

PC - 024 Anterior insula and mathematical cognition: Evidence from children and adults

Marie Arsalidou^{1,2}, Evgeny Khalezov¹, Anastasiia Liashenko¹, Alexey Kotov¹

¹Department of Psychology, National Research University Higher School of Economics, Moscow, Russia; ²Department of Psychology, York University, Toronto, Canada

PC.e - 025 What is a good question-asker better at? From no generalization, to overgeneralization, to adults-like selectivity across childhood.

Costanza De Simone, Karla Koskuba, Azzurra Ruggeri

MPRG iSearch, Max Planck Institute for Human Development, Berlin

PC.e - 026 Dual-mode model for over-imitation

Hanna Schleihauf, Stefanie Hoehl

Max Planck Institute for Human Cognitive and Brain Sciences

PC - 027 Spontaneous level-2 perspective taking and its relation to different group membership manipulations

Lívía Priyanka Elek¹, Renáta Szücs¹, Katalin Oláh¹, Fruzsina Elekes^{2,1,3}, Máté Varga⁴, Ildikó Király^{2,1}

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PC - 028 Children's explanations of intentional behaviour

Ramiro Glauer¹, Andrea Hildebrandt², Frauke Hildebrandt¹

¹University of Applied Sciences Potsdam, Germany; ²University of Oldenburg, Germany

PC - 029 The effect of cultural context on spontaneous level-2 perspective taking

Lívía Priyanka Elek¹, Katalin Oláh¹, Renáta Szücs¹, Fruzsina Elekes^{2,1,3}, Clara Ajisukmo⁴, József Topál², Ildikó Király^{2,1}

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PC - 030 Question comprehension in Autism Spectrum Conditions

Elisabet Vila Borrellas^{1,2}, Joana Rosselló Ximenes², Wolfram Hinzen^{1,3,4,5}

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PC - 031 The immediate effect of fast- and slow-paced digital games on children's executive functions and attention

Veronika Konok, Krisztina Peres, Dorottya Júlia Ujfalussy, Zsolt Jurányi, György Kampis, Ádám Miklósi
Eötvös Loránd University, Department of Ethology, Budapest, Hungary

PC - 032 - “She wants a teddy bear”: for 13-month-olds, requests are about kinds, not about specific objects

Otávio Mattos¹, Cristina I. Galusca², Zsuzsanna Karap¹, Marianna Nagy¹, Dorottya Meszegeto¹, Gergely Csibra¹

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PC - 033 Skin colour does not matter on experience of body-ownership in children

Beatrix Lábadí

Institute of Psychology, University of Pécs, Pécs, Hungary

PC.e - 034 The neuronal dynamics of infants’ imitation learning

Moritz Köster¹, Miriam Langeloh², Christian Kliesch², Patricia Kanngießer¹, Stefanie Hoehl²

¹Free University Berlin; ²Max Planck Institute for Human Cognitive and Brain Sciences

PC.e - 035 How do children interpret novel manual-gestural labels?

Edina Bulatovic-Hajnal¹, Nuria Sebastian-Galles¹, Agnes Kovacs²

¹University Pompeu Fabra; ²Central European University

PC - 036 The Development of Attentional Orienting and its Relation to Cognitive Development

Berna A. Uzundag, Sümeyye Koşukulu, Aylin C. Küntay

Koç University, Istanbul, Turkey

PC - 037 Sustained shared thinking boosts children’s verbal behaviour

Juliane Burmester¹, Tina Marusch¹, Jan Lonnemann¹, Frauke Hildebrandt², Julia Festman³

¹University of Potsdam, Potsdam, Germany; ²University of Applied Science Potsdam, Potsdam, Germany; ³Pedagogical University Tyrol, Tyrol, Austria

PC - 038 Max in cahoots with the Duplo Girl: Robust false belief test performance despite different task demands.

Beate Priewasser, Katharina Schweller, Franziska Fowles, Josef Perner

Centre for Cognitive Neuroscience, University of Salzburg

PC - 039 Children’s preference of self-generated over predetermined information during cued recall

Karsten Manske¹, Frauke Hildebrandt²

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PC - 040 Understanding the moral consequences of a hindering action is related to false belief understanding

Beate Priewasser, Franziska Fowles, Katharina Schweller, Josef Perner
Centre for Cognitive Neuroscience, University of Salzburg

PC - 041 How do children construct the color lexicon? A developmental and comparative study of concept formation

Cornelia Schulze¹, Gerlind Grosse², Mutsumi Imai³, Noburo Saji³, Henrik Saalbach¹
¹Leipzig University; ²Potsdam University of Applied Sciences; ³Keio University

PC - 042 Young children's ability to critique each other's reasoning

Bahar Koymen, Andreas Domberg, Cathal O'Madagain, Michael Tomasello
Ecole Normale Supérieure, Paris

PC - 043 Pedagogical Interaction Style and Exploration in 3-Year-Old Children

Caroline Wronski¹, Birgit Elsner²
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PC - 044 Comprehension of referential noun phrases in Autism Spectrum Conditions (ASC)

Kristen Schroeder^{1,2}, Joana Rosselló Ximenes², Wolfram Hinzen^{1,3,4,5}
¹Grammar and Cognition Lab, Barcelona, Spain; ²Universitat de Barcelona, Barcelona, Spain; ³Universitat Pompeu Fabra, Barcelona, Spain; ⁴ICREA-Catalan Institution for Research and Advanced Studies; ⁵FIDMAG- Germanes Hospitalàries Research Foundation, Barcelona, Spain.

PC.e - 045 The impact of a musical intervention on preschool children's executive function skills.

Kathryn Mason¹, Alice Bowmer¹, Julian Knight², Graham Welch¹
¹UCL Institute of Education, London, UK; ²Creative Futures, London, UK

PC - 046 Modulators of perspective taking abilities in conversational contexts in 3-6 year-old children

Dora Kamps^{1,2}, Charlotte Grosse Wiesmann^{1,3}, Lotte Berthelsen¹, Victoria Southgate¹
¹University of Copenhagen, Copenhagen, Denmark; ²Central European University, Budapest, Hungary; ³MPI, Leipzig, Germany

PC - 047 The influences of intentionality and effectiveness of adults' behavior on imitation of object-related actions in children with autism

Lidia Shimanovskaya, Tatyana Kotova

Russian Presidential Academy of National Economy and Public Administration (RANEPA)

PC - 048 Social group selectively trumps efficiency: Infants imitate sub-efficient actions of linguistic ingroups

Nazli Altinok¹, Ildiko Kiraly^{1,2}, Gyorgy Gergely¹

¹Cognitive Development Center, Central European University; ²Eötvös Loránd University

PC - 049 Names, facts or emotions: what evokes declarative points?

Tatyana Kotova

National Research University Higher School of Economics, Moscow, Russia

PC - 050 The development of feature- and category-based guidance of attention in early childhood

Anne Mills¹, Megan von Spreckelsen¹, Emma Dove¹, Daniel Ansari², Ann Dowker¹, Rebecca Merkley³, Victoria Murphy¹ and Gaia Scerif¹

¹University of Oxford, UK; ²University of Western Ontario, Canada; ³Carleton University, Canada

PC - 051 Fifteen-month-olds do not prefer helpers over hinderers: A failed replication of Hamlin et al. (2007)

Laura Schlingloff, Denis Tatone, Gergely Csibra

Cognitive Development Center, Central European University, Budapest

PC.e - 052 Gaze-triggered looking-while-listening: A new method for measuring speed of processing

Julia Egger¹, Caroline Rowland^{1,2}, Christina Bergmann¹

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PC - 001 Exploring the structural neural background of body ownership

Timea Budai, Beatrix Lábadí, Nikolett Arató, Orsolya Inhof, Szabolcs Bandi, András Zsidó, Gergely Darnai, Kata Lénárd

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Body ownership refers to the special perceptual status of one's own body, when I feel that „my body” belongs to me. It is a complex multidimensional phenomenon, including the tendency of consciously focusing our attention to bodily senses. We know that there is a great amount of functional MRI studies on body ownership, but we don't know about any research targeting the structural neural background, however the stronger long term effects might appear in structural differences as well. In our research we had 74 participants (mean age: 21,12). We applied the rubber hand illusion (RHI), which is an experimental paradigm we can investigate the sense of body ownership with. During the illusion, watching a rubber hand being stroked synchronously with one' own hidden hand causes the rubber hand to feel like it belongs to one's own body, like it's their hand. We did the illusion both on the right and the left hand with synchronous and asynchronous stimulation. We also used questionnaires targeting body awareness and eating disorders. We also used MRI measurements to identify the brain structures related to body ownership. One of our main results suggests that the rostral anterior cingulate plays an important role in the suggestibility on body perception, because we found significant differences between drifts both in synchronous and asynchronous stimulation on the left and the right hand. This drifting is independent from body ownership, it's not a subjective experience, rather a sensory effect.

PC - 002 Is the path or the goal more important? Effects of age in an imitation choice task

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Setting and pursuing goals direct our behavior throughout life. Goals can be defined as cognitive representations of the association of means and their outcomes. According to previous research in adulthood, the relative salience of the means and outcomes of goal pursuit (i.e., goal focus) changes with age. However, there is no systematic research into the development of goal focus across the entire lifespan, including childhood, as of yet. To fill this gap, we invited participants between 3 and 85 years to complete multiple tasks based on simple actions, feasible for all age groups (N = 309). Here, we focus on the imitation choice task (adapted from Elsner & Pfeifer, 2012), in which participants were able to choose whether to imitate the means at the expense of the outcome or vice versa of different directed motion events they had observed beforehand. Data from the first n = 104 participants show age-related differences with regard to whether the means or outcomes are imitated, $\chi^2(7, n = 104) = 80.03, p < .001$, with a tendency that imitating the outcomes decreases with age, estimate = 0.01, SE < 0.01, p = .06. However, pairwise group comparisons show no significant differences when

adjusting for multiple testing. Further, we find an effect of stimulus material, $X^2(2, n = 104) = 42.12$, $p < .001$, which suggests that goal focus is influenced by other variables than age alone as well.

PC - 003 Namable spatial features improve category learning in adults and children

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A recent study (Zettersten & Lupyan, 2018) showed that category features can be named influence category learning: when underlying features of the category were easy to name, participants were faster and more accurate in learning the novel category. In our experiment we extended these findings. The nameable feature in our experiment was a spatial location of different images. Participants (adults (N= 59) and 6-9-year old children (pilot study) should learn a new category. One group (high nameability) was shown images in more-namable places on a foot silhouette (e.g; "heel"). The other group (low nameability) was shown images in places without common names (e.g.; "vault"). The category rule combined relevant image and place. We have found that adults participants were learning new category faster in high nameability condition (for locations), than in low nameability condition. It seems that names allow learners to remember new information. The results of a pilot study suggest that children have not this effect at all or it would be observed in a lesser degree. The process of naming locations is less automatic in children. That is why they can not use names for identifying relevant characteristics of the category. We will present the results of our research on children and compare these results with the results on adults.

The research was prepared within the framework of the Academic Fund Program at the National Research University Higher School of Economics (HSE) in 2018 (grant N° 18-05-0001) and by the Russian Academic Excellence Project "5-100".

PC - 004 Deception and Constructivist Theory of Mind in early school age

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Successfully instilling a lie requires the ability to navigate through other's mind. We aimed to investigate the relation between constructivist theory of mind (ToMc), the ability to understand that people can come to different interpretations even when they are confronted with the same situation (Carpendale & Chandler, 2002), antisocial lies and parental rearing behaviors. In a group of children aged between 7-13 years old (N=130), deception and ToMc are measured using a modified version of the Trivia Game, which addresses both constructs together and independently. Children are instructed to answer correctly and offer a possible justification in order to win the game, while they

are also given the opportunity to transgress and lie about it. Results of this ongoing investigation will reveal if there is a link between ToMc and deception during this sensitive developmental window.

PC - 005 Highlighting an information gap influences children's exploration and learning

Eleanor Jordan, Christoph Völter & Amanda Seed

University of St Andrews

The information-gap theory (Loewenstein, 1994) suggests that curious individuals are driven to seek information in order to fill a gap in their knowledge, and that receiving small amounts of information increases curiosity by priming individuals on the potential for learning. We examined how highlighting an information-gap would affect children's exploration and learning. Forty seven children (2-5years) were given novel sets of 10 balls to explore (5 heavy, 5 light, coded by colour). Half of the children received balls with a 26g weight difference (low salience), and half a 56g weight difference (high salience). In Experiment 1, the children had two days of two 2-minute play sessions to explore the balls alongside a collapsible-platform box. Sessions 1 and 2 were separated by a reward session where inserting heavy balls released stickers. Each day, the children then made pairwise choices between the balls to try and release further stickers. In Experiment 2, the same children choose 5 novel balls for when the box returned. In Experiment 1, the high salience group performed more non-insertion exploration (e.g. weighing) than the low salience group ($\chi^2(1,43)=-2.28, p=0.02$). However, there was no difference between conditions in the number of heavy balls chosen ($t(38)=-0.14, p=0.89$). In Experiment 2, although there was no significant difference in the number of children performing weighing ($\chi(1,43)=3.22, p=0.07$), the high salience group chose significantly more heavy balls ($t(20)=-2.5, p=0.02$). We conclude that, highlighting an information-gap (through increased salience of weight differences) appears to provoke relevant exploration, and once a related goal was introduced, seemed to facilitate learning.

PC - 006 Children copy rationally when another communicative goal is a plausible explanation for inefficient action

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In an instrumental context, young children copy rationally: both situational constraints and demonstrator intention influence their copying fidelity. Even seemingly implausible actions are copied, even more so if demonstrations are accompanied by ostensive communication. In contrast, non-human primates only copy actions with plausible causal efficacy, perhaps because they do not recognise pedagogical intentions. We aimed to further explore the social and causal influences on the copying of capuchin monkeys (*Sapajus spp.*) ($n = 28$) and 3- to 5-year-old children ($n = 136$). Our transparent

puzzle-box contained two internal rotating shelves, one above the other. A 2-action sequence was demonstrated: pressing one button rotated the top shelf and pressing the second button rotated the bottom shelf, allowing the reward to fall out. We manipulated if both actions or only the second action was needed for reward obtainment by positioning the reward on either the top or the bottom shelf. Members of both species copied the action sequence more often when it was needed compared to when only the second action was sufficient. In contrast to previous studies, the social style of the demonstration (pedagogical, intentional, accidental) did not influence the tendency of children to copy the implausible action. This lack of 'over-imitation' might be due to children interpreting the demonstrator's goal as showing the button-shelf correspondence, making it unnecessary for them to posit some unknown reason for the inefficient action, and reducing their likelihood to copy it.

PC - 007 Testing Kindergarteners' Category Learning Strategies

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Background: Dual models argue for a double system behind category learning: an implicit and a separate verbal process. Early in development, because of the late maturation of frontal lobe, the implicit system dominates. Consequently, kindergarteners should acquire information-integration tasks easily. However, few existing studies couldn't demonstrate the presence of knowledge transfer at the age of 4-6 unequivocally. Our aim was to develop a useful information-integration task for kindergarteners and to test the dual model's hypotheses.

Method: 21 children age of 4-5 participated in a four-session training in four consecutive weeks where they got familiar with 8-8 exemplars (32 in total) of 2 categories. The training items were far-from-prototype exemplars according to a complex family resemblance structure. In the test phase 24 new exemplars including the prototype and close-to-prototype items were presented. Children's category decision reflected the presence of knowledge transfer.

Results: In the test phase right decision for the prototype and those far-from prototype exemplars which were similar to learning items were significantly above chance level.

Discussion: Knowledge transfer in case of kindergarteners is more difficult to trigger because of the lack of source memory information (they are not able to consciously apply what they have learned before). We developed a long-term training information-integration task with a help of which implicit acquisition of new categories was possible. Our results also reflect to the problem of exact differentiation between information-integration vs. rule-based tasks, so activation of implicit or verbal systems during category learning.

PC - 008 A systematic replication of the interactive false belief Sefo-task

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Explicit false belief tasks have been the litmus test for Theory of Mind abilities and established the emergence of meta representational capacities at age 4. Recently, using non-verbal false belief tasks, researchers found evidence for belief reasoning in infancy. In the so-called Sefo-task, which used interactive behavior as measurement, 17-month-olds adjusted their behavior according to an agent's false (FB) or true belief (TB) (Southgate, Chevallier & Csibra, 2010). In this task, two objects were placed each in one box. In either the experimenter's absence (FB) or presence (TB), the objects were swapped. With her return, she requested the infant to give her the "Sefo" by pointing to one of the two boxes. While in the TB condition infants chose the object in the referred box, they chose the object in the non-referred box in the FB condition, suggesting that 17-month-olds differently disambiguate the same referential utterance of the agent by taking into account the state of her belief. In the present study, we aimed at (1) replicating the study with the original age group (17-month-olds, n=48), (2) modifying the task regarding pragmatic ambiguities (2-year-olds, n=40), and (3) validating the task by testing 3-year-olds (n=48) with the original setup and an explicit standard task. In all age groups, we could not find evidence for false belief reasoning in the Sefo task nor could we find convergence to the explicit standard task. Further research should concentrate on the possible factors that lead to different behavioral pattern and thus to different results between the studies.

PC - 009 - The effect of ostensive communication on action pattern acquisition

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Actions are often learnt by observing other individuals (the demonstrators). How different social aspects affect their learning, in this context, has been poorly explored. Here we study the effect of a powerful social signal, the direct gaze of the demonstrator towards the observer, on the short-term and long-term memory of the observed actions. In Experiment 1, participants watched short videos of a demonstrator performing novel actions with novel objects only once, and were tested for immediate and delayed memory retention. Novel actions were better learnt if the demonstrator had gazed directly towards the participants. Experiment 2 investigated memory retention of novel and familiar actions paired with familiar objects. Direct gaze had a differential effect: it was detrimental for the long-term memory of familiar actions, but had no effect on novel action acquisition. These findings suggest that learning benefits from the demonstrator's direct gaze when no previous memory trace exists (novel actions with novel objects). Instead, direct gaze interferes with the retention of information already well-established in memory (meaningful familiar actions with familiar objects).

The effect of direct gaze after a brief presentation demonstrates the importance of social aspects in action processing and retention, and furthers our understanding of the role of nonverbal social signals in the transmission of information.

PC - 010 Between selective and exact imitation: 18 months-olds' performance in three types of imitation tasks

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The developmental trend from selective towards exact imitation through the second year of life has been demonstrated in a number of studies using different types of imitation tests. Infants shift from imitating a novel means action only if it seems to be rational towards imitating it regardless of its rationality (Gergely, 2003), from imitating only the action steps that are necessary to reach a goal towards imitating all action steps regardless of their necessity (Hilbrink, Sakkalou, Ellis-Davis, Fowler, & Gattis, 2013), and from imitating only functional actions towards imitating both functional and arbitrary actions (Óturai, Kolling, Rubio Hall, & Knopf, 2012). Although these test types are theoretically related and their findings converge on the developmental trend, not much is known about the consistency of infants' performance when presented with different types of tests. We tested the hypothesis that selective vs. exact imitation is consistent across test types in a group of 18-month-old infants. We present data on infants' imitation of novel means actions in two different contexts, necessary and unnecessary action steps, as well as functional and arbitrary actions within the same testing. Our findings show that although infants imitated to some extent selectively in all three tests, their degree of selective imitation was not consistent. Findings are discussed in the context of different action interpretation schemes guiding imitation, as well as some implications for test development.

PC.e - 011 Attributing ambiguous belief can influence first person information processing

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The main question of Theory of Mind research is not only how we represent others' mental states, but also how these representations influence our first person interaction with the environment. A pioneer study has shown that the mere presence of an agent triggers belief computation that influences - facilitates - the action execution of the self (Kovács, Téglás & Endress, 2010). The question is, whether besides situations where there is an obvious mismatch in the belief of the self and other (like in the study of Kovács et al), one forms an expectation of the other having a belief with a content unavailable for the self. In other words, whether humans are able to attribute by default a belief in ambiguous situations. We applied an object detection paradigm with two conditions – when the

agent was able to see what is inside the box (well before the object was revealed from occlusion for the participants) and when she was not. Our results show that participants decided quicker when an agent on the screen had perceptual access to the place of a potential object in the box. This pattern suggests that information processing is speeded up when an ambiguous content, namely the possibility that there is some content, is shared with someone. This study provides additional evidence on the spontaneous computation of others' mental states that has an effect on first person information processing.

PC.e - 012 Prediction by logical inference at 19 months

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Infants possess remarkable capacities to project hypotheses about complex events and rationally modify them facing inconsistent evidence. These capacities suggest the existence of elementary logical representations for framing and pruning hypotheses. Recently, experiments using the violation of expectations paradigm (VOE) revealed that infants and toddlers are surprised when they see an elementary scene ending with a situation incompatible with a potential logical inference (1). However, the nature and extent of pre-verbal logical reasoning, as well as its dependence on particular, experimentally-induced situations (such as the use of VOE), are still unknown. Here we investigate how generally and spontaneously infants employ logical inferences, in a novel multimodal paradigm. In it, 19-montholds must perform a logical inference to predict the location of an object in a computerized hide-and seek game. Looking times at the scene, and time-course analysis of gaze data, show that they attend to the correct position of a (hidden) object even when the location can only be known by logical inference. Our results show that the expression of early logical reasoning capacities is not limited to particular experimental tasks, suggesting that infants make use of logical representations in general, for making sense of their world.

(1) Cesana-Arlotti, N., Martín, A., Téglás, E., Vorobyova, L., Cetnarski, R., & Bonatti, L. L. (2018). Precursors of logical reasoning in preverbal human infants. *Science*, 359(6381), 1263-1266.

PC - 013 Can infants use multiple cues in learning phonemes?

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Distributional learning has been hypothesized to explain perceptual narrowing in speech perception; exposure to a bimodal distribution (along a continuum from [da] to [ta], with highest frequencies towards the ends of the distribution) leads to better discrimination of [da] & [ta] tokens compared to exposure to a unimodal distribution with a peak centered on the continuum. However, little is known

about how infants handle speaker variation that might result in a bimodal distribution of phones that reflect speaker idiosyncrasies rather than the presence of two underlying phonemes. In this study, we ask whether infants can integrate three different cues: token frequency distributions, multiple voices, and visually presented faces in inferring phoneme categories. In experiment 1, 6- to 10-mo-olds were tested their sensitivity to distributional information using a continuum from Hindi [ba] to [pa]. In experiment 2, 8-10-mo-olds were similarly tested, but stimuli were presented with two faces accompanying two bimodal continua recorded by two speakers. Both experiments used the alternating/non-alternating design (Maye et al., 2002). We additionally conduct this experiment with habituation/dis-habituation design to examine whether it elicits a different pattern of results. Data collection is ongoing. Preliminary results suggest that infants in Experiment 2 showed numerically longer looking times in non-alternating (token 3 or 6) than in alternating (token 1 & 8) test trials while infants in Experiment 1 didn't show such a pattern. If this pattern of results holds up, it would suggest that 8-10-mo-olds can make inferences about phonemic categories by using multiple information sources.

PC - 014 Reidentifying objects by their place in space and time: the development of object-individuation in the second year of life.

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Infant's ability to individuate objects lies at the heart of how they structure their environment and fundamentally limits the ways in which they can learn from ostensive communication. It is assumed that 12-month-olds can track objects based on spatiotemporal information (Xu, 2007; Xu, Carey, & Quint, 2004). Given the conceptual complexity of object individuation (Evans, 1982; Tugendhat 1976), we are skeptical about one-year-olds abilities and propose a test for object-individuation that goes beyond violation-of-expectation-paradigms (Hirsch, 1997; Wiggins, 1997). We collected data from one- and two-year-olds in a set-up in which an object is established as being special by having the experimenter and child engage with it temporarily. Then, two additional objects are revealed that look just like the first one. All objects are successively placed in three locations in front of the child. While they are identical with regard to surface features, one of them is special due to the shared history the experimenter and child have with it. At test, the child is prompted to retrieve the special one from the set of three indistinguishable objects relying solely on its location. Pilot data suggest that the probability of choosing the correct item is at chance level for one-year-olds (33%, n=6) but above chance level for two-year-olds (59%, n=22). Currently, we are running a control experiment in order to show that one-year-olds succeed in tracking a special object in a set of three items that are distinguishable on the basis of surface features.

PC - 017 Seeking out the majority: Preverbal expectations whether third parties will join the larger group

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Humans are a cultural, coalitional species. War is ubiquitous across human history (Tooby & Cosmides, 2010), and cultural knowledge also appears to decline when human groups fall below a critical mass (Boyd & Richerson, 2004). Thus, belonging to a large group compared to a small one, is likely advantageous. Previous research indicates that preverbal infants represent social dominance and expect not only that the more formidable individuals will prevail over less formidable ones (Thomsen et al, 2011; Mascaro & Csibra, 2012, Gazes et al, 2017), but also that members of larger, more formidable groups will prevail over members of smaller groups (Pun et al, 2016). Furthermore, recent evidence suggests that just-linguistic infants prefer agents to whom others defer (Thomas et al, 2018). Here, we test if infants aged 9-11 months expect third parties to join larger, rather than smaller coalitions (N=32). We showed them animations of two groups, one with four members and one with two, moving in synchrony on separate sides of a barrier, on top of which a third agent was observing the groups. Next, in the unexpected condition the agent joined the smaller group, and in the expected condition it joined the large group. We found a significant main effect ($F=4,37, p=.046$) that was however qualified by age ($F=4,35, p=.046$) such that 9-month-olds looked longest to the unexpected scenarios, 10-month-olds did not differentiate, and 11-month-olds looked longest to the expected scenarios.

PC - 018 Monolingual versus bilingual acquisition of discourse: Diversity in the development of macrostructure

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Discourse is less dependent on a child's language proficiency and environment factors than other domains, and considered universal in nature (Liles, 1993). Recent studies report that bilingual language acquisition shows higher levels of across-children diversity than monolingual acquisition in the domains of lexicon and grammar, but not in discourse (Haman et al., 2017; Lindgren, 2018). We examine the hypothesis that this difference for discourse acquisition holds true in monolingual and bilingual Russian speaking children. Therefore, we analyzed story grammar elements produced in elicited narratives (Stein & Glenn, 1979).

A total of 50 children ($n=24$ monolinguals, $n=26$ bilinguals, mean age 4 years and 10 months) produced elicited narratives, in the Multilingual Assessment Instrument for Narratives (MAIN, Gagarina et al. 2012, 2015). At the age of 8 years, the bilingual group was tested again with the MAIN and the standardized intelligence test Leiter-3 (Roid & Koch 2017).

A correlation analysis of story grammar elements showed that monolinguals scored significantly higher than bilinguals (Estimate=2.688, $p < .001$). Furthermore, bilinguals showed more diversity with several children performing at very low scores. The results of the second data collection are currently under analysis.

The bilingual group's larger score scattering show the variability in their narrative skills. They could be interpreted by the differentiated impact of various background factors on their macrostructure. To scrutinize this general finding, we further trace the developmental trajectory of discourse abilities in primary school children and relate this development to the general intelligence score.

PC - 019 Can infants learn an arbitrary word for negation in a few trials at 5 months of age?

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The framework under which the putative logical primitives in pre-verbal infants can function is of key importance in understanding the extents of primitive structure of language of thought in humans. In an eeg study we asked whether 5 mo old infants can understand that a pseudo-word which functions like a negation word, may refer to the negation operator and so to use it as the word for negation. For this purpose we home trained the infants to four pairs of pseudo-words and objects for over a week and during the experiment thought them that whenever the labels are accompanied by a pseudo-word 'kou', they may see any of the objects except the one that was originally corresponding to that label.

We gave them exemplars of application of 'kou' on three of the labels and tested them on the 4th label as well as on a novel object that they have never seen. The results of the cluster and permutation analyses suggest that infants can successfully discriminate between the incongruent and congruent applications of the negation word and subsequently apply it to the 5th object. We observed both early effects at p400 from image onset as well as late effects within one second after the offset of the image.

PC.e - 020 Linguistic versus inferential abilities in children's comprehension of speech acts

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Children's understanding of speech acts develops relatively slowly compared to their comprehension of truth-functional propositions. Our study looks at two alternative hypotheses as explanations for this delay. Verbuk & Shultz (2010) contend that children's difficulty is with the complex linguistic struc-

tures used to perform speech acts. Bernicot & Laval (2004), in contrast, argue that it is the inferential process involved in speech act comprehension that causes the difficulty. Our study directly tests the effects of syntactic complexity and inferential complexity on 3-6 year-old Hungarian children's ability to derive the illocutionary meaning of hints. The children were shown short animated stories in which one character dropped a hint. The children then had to choose from a set of four pictures the one depicting the intended consequence of the hint. The hints varied by syntactic complexity (simple sentence vs. complex sentence) and by inferential complexity (direct request vs. indirect hint). In addition to the speech act comprehension task, the children completed a nonverbal stroop task, a verbal working memory task and the TROG test. The results reveal that although TROG scores correlated with speech act scores, syntactic complexity had no effect on the children's performance. Inferential complexity, in contrast, had a significant effect: the children performed better in the low inferential complexity condition regardless of syntactic complexity. This suggests that the difficulty is with the inferential process rather than with language itself. This conclusion is also supported by the Stroop results: Stroop scores significantly correlated with speech act performance.

PC.e - 021 French-English bilingual children's sensitivity to genericity and specificity: evidence of implicit and explicit knowledge

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Off-line studies on the bilingual acquisition of genericity reported cross-linguistic transfer from the Germanic to the Romance language in the form of inappropriate form-function mapping (e.g.*null determiner in Italian/French in a generic context) that were mediated either by the wider-community language or by fluency (see Hervé & Serratrice, 2018). This paper assesses 8-to-10-year old French-English children's sensitivity to grammatical violation online and offline; and considers how individual measures of fluency and language exposure affect CLI. Forty-five French-English children, 24 French and 20 English monolinguals took part in a self-paced reading task (SPR) and an Acceptability Judgement task (AJT) in their respective language(s). In a generic context, French requires the projection of a definite article while English allows bare mass nouns and bare plural nouns. All the tasks across languages included 8 paired-sentences in the generic (e.g. Paul loves green fruits, he thinks 0/*the kiwis are delicious) and 8 in the specific condition (e.g. Julie wants to buy fruit at the market, she thinks the/*0 pears are ripe). Cattani et al.'s (2014) questionnaire was used to measure language exposure and fluency. Our results show bi-directional CLI in the online tasks only. In French, the bilinguals significantly differ from the monolinguals in the SPR but not in the AJT. In English, reading times increased for ungrammatical sentences in the SPR as a function of French fluency. In the AJT, the bilinguals' higher acceptance rates of ungrammatical sentences are correlated to English exposure. These results will be discussed in terms of explicit/implicit knowledge (R.Ellis, 2005).

PC - 022 The Interrelations between Different Aspects of General Cognitive Abilities in Early Child Development

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Existing research has provided fascinating insights into the roles of various cognitive domains in early human development. However, every domain tends to explain developmental changes within their own theoretical frameworks and research traditions, leaving unknown the probable interrelation among different cognitive domains. To fill in this research gap, we established a joint research program across six infant labs in Germany, investigating the interplay of language, cognition, and socio-cognitive abilities in early life. In the central project, we developed a unique battery of eye-tracking tasks and examined the interactions between inhibitory control, processing speed, and recognition memory. Tasks in the battery were adapted from existing paradigms (Kovács & Mehler, 2009; Rose, Feldman & Jankowski, 2004) and implemented in all labs. A large sample (so far >400) of 12-, 24- and 36-month-olds were tested with the eye-tracking tasks and standardized assessments of cognitive and language development. We then analyzed the data using structural equation modeling. Current results suggested that recognition memory positively predicts processing speed and that processing speed positively predicts inhibitory control. Also, the development of general cognitive abilities significantly predicts both receptive and productive language skills. We also related the central project with another project in the program that examined 24- and 36-month-olds on their learning of non-adjacent dependency (NAD) using fNIRS measures. We hypothesized that as inhibitory control develops children are less likely to learn NAD. In line with this, we found that the development of inhibitory control negatively predicts the learning of NAD in the language domain.

PC - 023 Early production of metonymy

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Even before age four, children can produce highly creative examples of referential metonymy, as below where the expression 'frogs' is being used metonymically because it literally refers to a salient, identifying component of the target entity (the game played): We were playing frogs (= game involving pretending to be frogs).

Yet while there is a growing body of empirical evidence concerning children's metonymy comprehension (e.g. Falkum, Recasens & Clark, 2017), metonymy production remains understudied. To begin to redress this, data from the Thomas corpus in the CHILDES database (MacWhinney, 2000; Lieven, Salomo & Tomasello, 2009), covering the 6-month period when Thomas was aged 3;6-3;12 (over 32 hours of speech), was analysed to investigate early referential metonymy use. Also of interest were other reference-making devices, e.g. noun-noun compounds, and phenomena relevant to pragmatic development, e.g. metalinguistic awareness. The data was inspected line by line for instances of the

target phenomena, which were extracted and coded. The findings reveal that Thomas is able to use phenomena like referential metonymy (22 instances) and noun-noun compounds (133 instances) to produce innovative labels for entities in an adult-like manner. Thomas' output also indicated developmental milestones yet to be reached, including the ability to adequately consider common-ground information. Additionally, and most strikingly, Thomas exhibited exciting evidence of emergent metalinguistic awareness (21 instances). This is an important result, as metalinguistic abilities are not traditionally predicted to emerge until around age four (Doherty & Perner, 1998). Overall, Thomas' referential expressions display a remarkable capacity for licensed innovation.

PC - 024 Anterior insula and mathematical cognition: Evidence from children and adults

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The anterior insula, a sub-lobar brain region, responds to interoceptive, emotive and cognitive tasks. However, it remains unclear why some tasks implicate more insula cortex than others. To examine quantitative differences in insular implication as a function of difficulty and cognitive competence (i.e., children and adults), we review the literature on mathematical cognition. Neuroimaging results from extant activation likelihood estimate (ALE) meta-analyses (N = 7) that examine more than 150 functional neuroimaging studies were assessed. Results show that (a) task difficulty influences ALE values and spatial extent of insular function, and (b) when task difficulty is controlled or during passive tasks insula contributions are eliminated or absent. We conclude with testable predictions that identify the anterior insula as a marker in individual differences in task investment influenced by differences in mental competence of the individuals and the mental demand of the task.

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PC.e - 025 What is a good question-asker better at? From no generalization, to overgeneralization, to adults-like selectivity across childhood.

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Prior research showed that young children are selective social learners and consider others' knowledge and expertise to decide from whom to learn. More recent research suggests that young children are also sensitive to the process by which they have acquired this knowledge and prefer to seek help from actors who have demonstrated active learning competence. What do children infer

from the ability to ask informative questions? The current project explores across two experiments to what extent adults (N = 40) and children (3- to 9-year-olds; N = 120) generalize the ability to ask informative questions to other more or less-related domains, and how this tendency develops across childhood. We presented participants with a storybook introducing two monsters: one monster always asks informative questions and the other always asks redundant, uninformative questions. After this familiarization, participants were asked to choose which monster they thought was most likely to possess/was better at 12 different characteristics/abilities (e.g., being clever, being good at treasure hunting, being friendly, scoring lots of goals). Our results show a clear developmental trend. Three- and 4-year-olds did not draw any inference from the monsters' question-asking expertise. Five- and 6-year-olds showed a clear halo-effect, identifying the better question-asker as better at everything, suggesting a limited understanding of the question-asking expertise's domain-specificity. Seven- and 8-year-olds showed adult-like response patterns, selectively associating the ability to ask good questions to some of the other characteristics/abilities, with different strengths (e.g., being good at school), but not to others (e.g., being good at soccer).

PC.e - 026 Dual-mode model for over-imitation

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Children and adults tend to imitate actions that are irrelevant to accomplishing a goal, they "over-imitate". This behavior is discussed to play a role in the evolution of conventions and rituals. If that is the case, we should overimitate, even when we know that there is a more efficient way to reach a goal. Furthermore, we should imitate ritual-like actions (not involving physical contact with the reward-container) more frequently than non-functional pseudo-instrumental actions (perceivably irrelevant, involving physical contact with the reward-container, similar to actions that lead to effects). In the present study, we investigated if overimitation maintains, when children see an inefficient and also an efficient strategy to extract a reward from a puzzle-box, i.e. when it was ensured that children knew about the irrelevancy of demonstrated actions. We had one condition in which children saw equivalent demonstrations of the inefficient and the efficient strategy, before it was their turn, and one condition in which children saw a pedagogical inefficient strategy and a non-pedagogical efficient strategy. The inefficient strategy included ritual-like actions and pseudo-instrumental actions. We found that children had a stronger tendency to copy irrelevant actions if the efficient strategy was demonstrated in a non-pedagogical context and, contrary than predicted, that children copied pseudo-instrumental actions much more often as ritual-like actions, although they knew that they had no function.

We introduce a dual-mode model for overimitation with two copying modes, that suggests that pseudo-instrumental actions are processed differently than other irrelevant actions and are imitated with higher rates.

PC - 027 Spontaneous level-2 perspective taking and its relation to different group membership manipulations

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Recent research provided evidence that level-2 perspective taking, the ability to represent how others see something is a spontaneous mechanism, yet selectively occur under specific circumstances. The evidence on such selectivity or context sensitivity directs the focus of research to identifying external factors that might influence the process. Given that perspective taking is strongly linked to social interactions, we wanted to investigate contextual effects in terms of social cues. More precisely, we wanted to test whether group-membership of an individual might alter spontaneously updating the perspective of the partner and thus, understanding of a visual scene. 8-9-year-old participants had to perform a number verification task while we measured the occurrence of altercentric intrusion. Children in the first experiment were paired with same-age peers, who either shared their minimal group membership or belonged to a different minimal group. Group membership in this case was created by giving instruction to cooperate or compete with each other. In the second experiment children were paired with an adult confederate, who either shared their cultural group membership or belonged to a different cultural group based on linguistic cues (native or accented language use). Our results suggest that, although minimal group membership did not alter the process of spontaneous level-2 perspective taking, cultural group membership did. Specifically, there was no impact of the other's differing perspective when she belonged to a cultural out-group. Our results indicate that social factors are important cues to which the process of spontaneous level-2 perspective taking shows sensitivity.

PC - 028 Children's explanations of intentional behaviour

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Perner & Roessler (2012) argue that children explain behaviour in terms of objective reasons before as well as after the acquisition of false-belief (FB) understanding. An objective reason is an obtaining fact that explains the success of some behaviour. Children who possess FB understanding can also attribute subjective reasons — which need not obtain.

In the present study (n=104, 50 female), children (age 3;11-9;5, M=5;9, SD=1;2) are asked why someone behaves in a certain way. This taps their explicit understanding of reasons. Children without FB understanding should answer by giving a fact that explains the success of the behaviour while children with FB understanding should provide a state of affairs — which need not obtain — that would explain the success of the behaviour. This answer would have to be marked as not obtaining by a non-factive mental-state expression ('believes that').

Results show that children without FB understanding are more likely to give fact answers than children with FB understanding ($X^2=28.049$, $df=1$, $p<0.001$, $\gamma=-0.835$) who, in turn, are more likely to use mental-state expressions ($X^2=6.6926$, $df=1$, $p<0.01$, $\gamma=0.663$). However, children with FB understanding commonly explain why it is reasonable to hold such a belief, indicating that the transition marked by FB understanding is more complicated than a mere transition from objective- to subjective-reasons explanations. Differences between explanations in true- and false-belief situations and between first and third person explanations were considered.

PC - 029 The effect of cultural context on spontaneous level-2 perspective taking

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Ongoing research focusing on perspective taking suggests that it is a flexible and context-dependent mechanism. More specifically, whether or not level-2 perspective taking occurs spontaneously seems to be determined by contextual factors. Our recent results indicate that social characteristics of the partner (i.e.: cultural group membership, but not minimal group membership) have an impact on the process of spontaneous updating of the other's perspective and the related knowledge state. Relatedly the relevance of different social cues might not be universal. Given the social nature of perspective-taking, the cues which prove themselves to be relevant might reflect the social structure of a specific society. While the ability of spontaneous level-2 perspective taking may be universal, the factors that influence its spontaneous operation might be culturally determined. The present work investigates this idea by testing the occurrence of spontaneous level-2 perspective taking in the collectivistic culture of Indonesia. 8-9-year-old participants had to perform a number verification task in pairs while we measured the occurrence of altercentric intrusion. Manipulating the confederate's cultural group membership and including an own-age control group allowed us to capture the possible differences in influential social factors. We replicated the presence of spontaneous level-2 perspective taking with own-age peers, but not when the confederate was an adult in-group or out-group. This pattern differs from our findings gathered in individualistic cultures and thus suggests a possible cultural difference between the hierarchy of relevant social-contextual factors influencing spontaneous level-2 perspective taking.

PC - 030 Question comprehension in Autism Spectrum Conditions

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Children with Autism Spectrum Conditions (ASC) tend to have difficulties initiating and following conversations and respecting turn-taking. Despite questions being essential in turn-taking and in standard theory of mind (ToM) assessments, how their structure and prosodic aspects impact comprehension in ASC have been understudied, particularly in languages other than English where prosody plays a more critical role. Here we examined the comprehension of both wh- and yes/no questions in a classical ToM task compared to a non-ToM task, also varying whether the task had visual support or not. In addition, participants passed an intonation task to assess their prosodic processing. The sample consisted of 34 Spanish-Catalan bilinguals with ASC without intellectual disability (mean age = 9;9) and 34 typically developing (TD) children (mean age = 9;3) matched on verbal mental age. Results showed that both ASC and TD groups had significantly greater difficulties with wh- as compared with yes/no questions. However, ASC participants had significantly poorer comprehension of wh- but not yes/no questions relative to TDs across tasks. The two groups did not differ in the intonation task. The ASC group also scored significantly lower than the TD group in the comprehension of both ToM and non-ToM questions with visual support, and in non-ToM tasks without visual support. This pattern suggests that even language-matched children with ASC show differences in comparison to TD children in syntactically more complex question types, irrespective of false belief content, and partially independently of compensatory help through visual support.

PC - 031 The immediate effect of fast- and slow-paced digital games on children's executive functions and attention

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Children can play games on mobile devices (mobile phone, tablet) at an earlier age than on traditional platforms (e.g. PC) because of the touchscreen. This early experience can have more significant and different kind of effects on cognitive processes than those gained later in life. Playing games often entails fast changing of visual patterns and the necessity of precise movements. Previous results suggest that the pace of TV shows affects children's executive functions, but the content of these shows was not controlled for. Fast games may also increase stress level, possibly through frustration or overstimulation. Additionally, preparation for precise vs. gross movements has been found to cause a shift from global to local visual processing in adults.

In an experimental study, we investigated whether after a short-term exposure to a fast-paced mobile

game, 4-5-year-old children perform worse on executive functions, show higher local advantage and physiological stress level compared to children who played with a same-content, but slower-paced game or who engaged in non-digital, self-paced activity. We measured response inhibition, task-switching, attention control (selective/divided attention) and local/global processing with a preschool version of the Navon test, and physiological stress level with heart rate measurement. Results are discussed in light of what we know about the effects of TV watching and video-games in children.

PC - 032 “She wants a teddy bear”: for 13-month-olds, requests are about kinds, not about specific objects

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We investigated the hypothesis that young infants interpret object referring expressions as specifying an object kind rather than a particular entity. We capitalized on the paradigm pioneered by Tomasello and Haberl (2003), which found that infants resolve ambiguous requests by considering what is novel to the speaker. Thirteen-month-old infants ($n = 48$) were participants in an object requesting game. In each trial, the infant and an experimenter (the Requester) played with a toy together, and when the Requester left the room, a second toy was introduced by another experimenter. This toy was (between subjects) either of the same kind as (SK), or different kind from (DK), the first toy. Upon her return, the Requester expressed excitement at the sight of the toys and made a request: “Wow, that’s so cool! Can you give it to me?” The dependent measure was proportion (of four) trials in which the new object was offered to her. Wilcoxon Signed-Ranks Tests indicated that the infants gave the new toy more often than chance in the DK condition ($p = .0003$), but not in the SK condition ($p = .313$). However, a Mann-Whitney test did not reveal a significant difference between the DK condition ($Mdn = 0.67$) and the SK condition ($Mdn = 0.57$) regarding giving the new toy ($p = .074$), nor between the DK ($Mdn = 0$) and the SK ($Mdn = 0$) conditions regarding giving both toys ($p = .089$). Altogether, these results only partially suggest that young infants consider others’ experience with a kind of object, as opposed to a specific object, when inferring the referent of their requests.

PC - 033 Skin colour does not matter on experience of body-ownership in children

Beatrix Lábadí

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Present study focused on the question whether multisensory stimulation can lead participants to experience ownership over a hand of different skin colour in childhood, when children rely more on the sight of the hand and less on its proprioceptively felt position. In this experiment children

between 5 to 12 years completed the rubber hand illusion (RHI) paradigm either in dark and white hand condition while measuring their social attitude toward in-group and outgroup members before and after RHI. The findings showed that the synchronous multisensory stimulation was successful in eliciting an induced sense of body-ownership over either dark and white colour rubber hand in children regardless of age. After the synchronous multisensory stimulation the experience of ownership over dark rubber hand reduced the explicit racial bias toward outgroup members. These findings demonstrate that even children are able to incorporate a rubber hand into their body regardless of skin colour however this experience alters their racial bias.

PC.e - 034 The neuronal dynamics of infants' imitation learning

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From early on, infants imitate others' actions, allowing infants to acquire the practical knowledge of their cultural group. In particular, pedagogical signals of interaction partners are assumed to facilitate early learning processes. Here, we studied infants' neuronal oscillatory activity during imitation learning in a pedagogical context. We demonstrated 12 actions, performed with different objects, to 10- and 20-month-old infants (n = 48 and n = 47), while recording their EEG. Actions were either demonstrated in a pedagogical or a non-pedagogical context. Thereafter we (1) presented another individual performing the same or a different action with the same tool and (2) gave 20-month-olds the opportunity to imitate the observed actions in a subsequent play session.

We will present our results with regard to the hypothesis that (1) both 10- and 20-month-olds are surprised if another individual performs a different action, in particular when presented pedagogically. Furthermore, we hypothesize that (2) 20-month-old infants will imitate more actions presented in a pedagogical context compared to the non-pedagogical context. This effect may be predicted by the neuronal dynamics during encoding: In a preliminary analysis, we found a strong 4Hz theta activity at central electrodes (C3 and C4) during action observation and we expect that differences theta power will moderate the link between pedagogical communication and infants' imitation. While the theta rhythm has been identified as a neuronal learning mechanism previously, here we first pinpoint its function in infants' early acquisition of generalized practical knowledge.

PC.e - 035 How do children interpret novel manual-gestural labels?

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One crucial ability in early language development is having the proficiency to map a label to its referent. Studies suggest that at the onset of language acquisition, infants have the general ability to link different kinds of labels words, sounds, pictograms, gestures – to objects (Namy&Waxman,1998;

Woodward&Hoyne,1999). However, as experience with spoken language increases hearing toddlers and preschoolers prefer conventional linguistic forms over gestural items, and reject arbitrary gestures as labels (Suanda&Namy,2013; Marentette&Nicoladis,2011). In this study, we asked whether in context in which the manual-gestural labels are part of a linguistic system – namely Sign Language (SL), preschoolers would treat these signs as object names. To test this, children were first exposed to a short conversation between an experimenter using SL and one a spoken language and performed a task where we combined a teaching phase with a mutual exclusivity phase. In each trial, children were shown two unknown objects and one was labelled with a gesture. Afterwards, the experimenter either asked for the previously labelled object (using the just-learned gesture), or for the unlabeled object (using a new gesture). While data collection is still in progress, preliminary results suggest that older preschoolers (N=13, M=5.0 years), but not the younger ones (N=10, M=4.0 years) associated the previously learnt signs with their correspondent objects ($p=0.02$), while both groups failed to use mutual exclusivity to identify unlabelled objects. To find out whether a short exposure with SL in communication plays a role, a control study is run with no initial SL exposure.

PC - 036 The Development of Attentional Orienting and its Relation to Cognitive Development

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Attentional orienting —the ability to engage, disengage, and shift focus- helps infants to learn about their environment (Rothbart et al., 2011). The present study is the first to use a typical orienting task to investigate the development of orienting from infancy to toddlerhood and whether orienting predicts later cognitive and communicative development. At 8 months, we tested 21 infants on a disengagement task where 13 infants were retested at 18 months. A central stimulus appeared first followed by a peripheral stimulus 2000 ms later. Both stimuli remained on the Tobii-T120 eye tracker for 5000 ms in ten trials. Latency to shift attention to the peripheral stimulus and shift rate between the two stimuli per second were measured. Receptive and productive language were measured via the Turkish MacArthur-Bates Communicative Development Inventory (Aksu-Koç et al., 2009) at 14 and 18 months, respectively. At 18 months, the Bayley-III Cognitive Scale (Bayley, 2006) was administered to assess cognitive development. Mixed-effects analyses showed a decrease in shift rate from 8 ($M(SD)=1.04(0.35)$) to 18 months ($M(SD)=0.95(0.29)$), (Estimate=-0.15, SE=0.07, $p=.05$), with no significant change in latency. Shift rate at 8 months was significantly associated with the Bayley scores, $r=.58$, $p=.048$. Attentional measures were not related to language measures. Overall, (1) the decrease in shift rate over time may imply an increase in sustained attention, (2) other types of attention (e.g., joint attention) may be more relevant to language learning, and (3) the ease of disengaging attention, i.e. higher shift rates, may indicate efficient information processing.

PC - 037 Sustained shared thinking boosts children's verbal behaviour

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Recent research regarding children's linguistic and cognitive development emphasizes the importance of conversational turns (Romeo et al., 2018) and of ideal settings for children's playfully inquiring minds (Gopnik, 2012). One way to achieve this is sustained shared thinking (SST, Siraj-Blatchford et al., 2002), a form of cognitive co-operation, which aims at joint mental problem solving, i.e., adult and child are engaged in intellectual exchange.

In the present study we characterize SST-like adult-child interactions regarding factors that might induce a positive impact on the child's verbalized thought-processes e.g., in terms of increased number of self-generated hypotheses, length of utterances, and conversational turns. We mainly focussed on: 1) child-specific factors (language and cognitive skills), and 2) the quality of the adult's behaviour (e.g., social-emotional aspects, degree of SST-implementation).

Preliminary results of 16 video-recorded adult-child interactions show that interestingly, children's (3;1 to 6;8 years) verbal output in SST-interactions seemed to be independent of their age, language and cognitive skills. However, children's verbal output was directly influenced by the interplay of the adult's non-verbal and verbal SST-like behaviour. More specifically, adults' appropriately used open-ended and why-questions as well as what-if-scenarios elicited more conversational turns with the child, and let children build more own explanatory hypotheses. Moreover, social-emotional communicative aspects (such as maintaining eye-contact, actively waiting for and acknowledging children's statements) elicited more conversational turns. Our findings extend previous findings (Hildebrandt et al., 2016) suggesting that elements of SST in natural-like interactions positively affect the child's active participation in the conversation and in joint problem solving.

PC - 038 Max in cahoots with the Duplo Girl: Robust false belief test performance despite different task demands.

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In the past, the majority of research regarding false belief understanding has shown that children under four years generally do not pass the standard false belief test. Rubio-Fernandez and Geurts (2013), however, challenged this assumption, showing that three year olds have the capacity to solve a modified version of the false belief task. This finding has interesting implications with regards to recent studies that used indirect indicators, such as anticipatory looking, to provide evidence for belief understanding preceding verbal answers in the standard false belief test. This can be attributed to an implicit understanding of belief, or it might be evidence for an earlier detection of explicit understanding, delayed due to processing limitations or pragmatic features. To enable a detailed

discussion of the potential implications, when replicating the study by Rubio-Fernandez and Geurts (2013) we added both, a standard change of location false belief task as well as a true belief task. Specifically, the true belief task enables to decide whether correct answers in the Duplo false belief task reflected earlier evidence for false belief understanding or merely a difference in guessing rate (see discussion between Kammermeier & Paulus (2018) and Rubio-Fernandez (2019)). We found (1) a greater variability of children's responses in both Duplo tasks, (2) no evidence for earlier competence in the Duplo tasks than in the standard false belief test. Reassuringly, false belief tasks were correlated, suggesting that the Duplo task does pick up understanding of belief by the lights of the standard test.

PC - 039 Children's preference of self-generated over predetermined information during cued recall

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The development of one's own ideas is often seen as a characteristic of effective teaching and learning in early childhood education (e.g. Purdon, 2016). The ability of children to retrieve relevant information from memory is one practice-oriented indicator of children's learning performance in early education. In our current research, we investigate how children deal with the discrepancy of self-generated vs. predetermined competing information when asked to recall information encoded in a dialogical interaction between adult and child. In a first study 44 preschool children aged between four and six years (mean age = 63.03 months; SD = 8) learned pictures and associated causal hypotheses given by an adult. During the learning phase, we realized two experimental conditions of interaction processes between adult and child. We manipulated the level of shared epistemic status and the encouragement to think further in order to promote the generation of children's own causal hypotheses relating to the images. Results show children's increased propensity to form own hypotheses in the case of shared epistemic status during the learning phase. When retrieving information from memory during a recall task, the children's response behaviour indicates a preference for the reproduction of the self-generated hypotheses over the adults' predetermined hypotheses. In addition, preliminary results from an ongoing complementary study suggest that children are unable to maintain two competing causal hypotheses simultaneously. Initial analyses indicate that although the majority of adults' competing hypotheses do not appear to be rememberable, they seem to affect children's ability to recall their own hypotheses.

PC - 040 Understanding the moral consequences of a hindering action is related to false belief understanding

Beate Priewasser, Franziska Fowles, Katharina Schweller, Josef Perner

Centre for Cognitive Neuroscience, University of Salzburg

In a pilot study 24 pre-schoolers were shown two puppet-shows including a protagonist and two agents, one helping and one preventing a protagonist from attaining a goal (Van de Vondervoort & Hamlin, 2017), and completed two traditional change of location false belief tasks. Replicating the results of the original study, children reliably preferred the helper, judged the helper to be nicer and assigned punishment to the hinderer. Furthermore, the correct selection of the hinderer as recipient of punishment was correlated with children's false belief score; this result remained significant even after partialling out age. Additionally, when asked to give a justification for punishing the hinderer, the majority of false belief understanders referred to the relevant action (e.g., because he shut the box) while non-understanders gave foremost uninformative answers or were not able to give a justification at all. This preliminary result suggests that the ability to adopt a perspective on an agent's belief is related to the ability to justify the moral consequences of the hinderers' goal impeding actions. Data are interpreted in line with the teleological account that understanding an agent's reason for an action based on believed facts (that conflict with actual facts) emerges with the understanding sabotage as an action based on conflicting values.

PC - 041 How do children construct the color lexicon? A developmental and comparative study of concept formation

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The meaning of a word and the boundaries of that meaning are determined by the meaning of the words belonging to the same semantic domain. This means that children need to learn a cluster of words in the same semantic domain and delineate the boundaries among them. This is particularly critical for color words, as compared to object names, because the continuous visible color spectrum does not have natural partitions and is represented differently in different cultures.

The present study investigates 1) how adult German and Japanese speakers delineate the boundaries between 93 color patches and 2) how 3 – 9 year-old children of these countries discover the boundaries of color names. We tested 26 participants of each of the following age groups in each country: adult, 3-, 5-, 7-, and 9-years. Participants were presented with the color patches and were asked "What color is this?" by the experimenter. Each color patch was presented only once.

We calculated the distances between the color names and compared categorization patterns between age groups using a multi-dimensional scaling analysis. For adults, we found a 3- dimensional solution, where the differentiating dimensions correspond roughly to brightness, warmth and saturation. We found similar results in German children as in Japanese children: Even 3-year-old children

could map color words to its typical referents. But at the same time, they struggled to delineate the boundaries between neighboring color words.

PC - 042 Young children's ability to critique each other's reasoning

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Ecole Normale Superieure, Paris

In collaborative problem solving, partners not only express arguments for their beliefs but they also reflect on and critique one another's arguments, especially when they have a valid objection. We investigated whether and how 3- and 5-year-old peer dyads use such counter-argumentation. Each child within a dyad was privately given a reason to prefer one over another solution to a task. One child, however, was presented with further information that would refute the reasoning of his/her partner, if she could recognize it as a valid objection. Our results suggested that 5-year-olds, but not 3-year-olds, were able to identify and produce counter-arguments when these were valid and relevant. Thus, by age 5, children can evaluate the reasons behind other's beliefs and challenge these through counter-arguments. This supports social constructionist theories of reasoning – that at the same age at which children acquire competence with explicit false belief tasks, they also acquire competence with more general abstract reasoning tasks.

PC - 043 Pedagogical Interaction Style and Exploration in 3-Year-Old Children

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Pedagogical demonstration of a novel object's functions promotes efficient learning but decreases exploration in preschool children (Bonawitz et al., 2010). We were interested in whether pedagogical interaction style had an effect on exploration behavior in younger kindergarteners. Three-year-old children (N = 40) were presented with a variant of the unusual box task (Bijvoet-van-den-Berg & Hoicka, 2014) in a between-subject design. Children in the pedagogical condition saw demonstrations of different actions on a novel toy, accompanied by "instructive" speech (e.g., "this is how it's done"). Children in the non-pedagogical condition received the same demonstration, but instead with "exploratory" speech (e.g., „this is how it could be done“). Each child received three trials with a new action demonstrated in each trial; actions were modelled twice per trial. After each trial, children were given 90 seconds to explore the box. Children's actions on the box during the exploration phase were coded for fluency, imitation, and originality. Results indicate that children in the non-pedagogical condition performed fewer imitative actions than children in the pedagogical condition while fluency was at the same level. This study suggests that a non-instructive pedagogical interaction style reduces the tendency to imitate and thereby might encourage exploration in young children.

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PC - 044 Comprehension of referential noun phrases in Autism Spectrum Conditions (ASC)

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Use of anomalous referential noun phrases (NPs) is well-documented in the speech of persons with autism spectrum conditions without intellectual disability (ASC-ID). Much less is known about the comprehension of such expressions and how potential deficits may intensify in ASC with intellectual disability (ASC+ID). We present two experiments assessing the comprehension of referential expressions among 45 children and adolescents with ASC, with and without ID (ASD+/-ID) compared to 39 verbal-age-matched controls, with and without ID. Experiment 1 assesses comprehension of NP types through a pointing task while attending to a picture book. Experiment 2 assesses the participants' ability to distinguish reference of an indefinite NP, 'is it a pencil?' from definite anaphoric reference, as in 'is it the pencil?'. Results showed a trend level lower performance among the ASC-ID participants in comparison to typically developing (TD) controls in pronominal NPs in experiment 1 and a significantly poorer comprehension of definite anaphoric expressions in experiment 2. The ASC+ID group significantly underperformed relative to both the ASC-ID group and controls with ID on pronominal tracking in experiment 1, suggesting that this increased vulnerability may not be attributable ID alone. Together these experiments suggest that referential expressions where lexical-descriptive content does not aid in deciding reference, i.e. in pronominals and definite anaphorics, pose an obstacle for successful comprehension across the autism spectrum. The ability to compensate for such weaknesses, such as through reliance on visual supports as present in experiment 1', may be attenuated by ID in this population.

PC.e - 045 The impact of a musical intervention on preschool children's executive function skills.

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Our research focuses on the impact of musical training on specific areas of children's cognitive development. In this presentation we will unpack a recent study, which looked at musical and arts training on Executive Function (EF) development in preschoolers. This was a 6-month study with two experimental phases. Our results from Phase 1 found a positive impact of music on pre-schoolers inhibitory skills. During Phase 2 (which included an active control condition, whereby children took part in an art training) we found no significant impact of music or art on children's EF skills. However, the children who took part in music training had a nearing significant advantage in their inhibitory skills after this phase. Our analysis considers the impact of training activities against specific EF

testing measures, as well as test sensitivity to changes in EF over time.

This paper will discuss the ways in which the study contributes to current debates about the potential cognitive benefit of musical interventions, including important issues regarding intervention duration, experimental design, target age groups, executive function testing and task novelty. We will also discuss how this exploratory study has informed our future research plans in this field. The extent to which particular interventions, such as music, have lasting impact on cognitive development is heavily debated. We argue that this may be due to a lack of mapping specific aspects of musical skill to appropriate testing measures.

PC - 046 Modulators of perspective taking abilities in conversational contexts in 3-6 year-old children

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In communication it is essential for a listener to take into account the perspective of an interlocutor. Adults (Keysar et al, 2000) as well as children (Epley et al, 2004) have been reported to have a tendency to commit 'egocentric errors' in communicative situations such as the director task where they were influenced by their own perspective when following a speaker's instruction. We hypothesized that these egocentric errors depend on the ability to distinguish self and other and might therefore be fostered by imitation inhibition in a social context.

The aim of the current study was to better understand the connection between perspective taking in communicative context, and inhibition in social and non-social contexts, and the ability to distinguish the self from others. The target age group was 3-6 year old children, who have been shown to undergo significant changes in targeted abilities. We administered a pre-task training (after Santieseban et al, 2011) to see whether a brief practice of social imitation (imitating a partner's actions), social imitation inhibition (doing the opposite of a partner's action), or non-social inhibition (in a stroop-like task) training may have an effect of children's ability to adopt a social partner's perspective. Following this, children participated in a director task, executive function measures (day/night task and bear/dragon task), a Theory of Mind scale, a task measuring altercentric modulation in social settings, and measures related to self-concept. Data collection is ongoing, and expected to finish December 2018.

PC - 047 The influences of intentionality and effectiveness of adults' behavior on imitation of object-related actions in children with autism

Lidia Shimanovskaya, Tatyana Kotova

Russian Presidential Academy of National Economy and Public Administration (RANEPA)

In the second year of life, infants are actively interested in objects used by adults, despite the num-

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ber of experienced difficulties in achieving their goals while handling these objects. In our previous study we verified the reason guiding a child's choice in an ambiguous condition modeled by situations which contrast intentional and effective adult behavior (Kotova, Yudina, Kotov, 2014). This results suggest that actions learned by the child become more relevant to planning and control of behavior across the development. Different patterns of emergence of early social-cognitive skills was found for children with autism and typically developing children: although imitation of actions was observed in both (Carpenter, Pennigton, Rogers, 2001). This study was conducted to investigate whether children with autism prefer to imitate intentional actions in the conditions analogous to the Kotova et al.'s study (2014). 10 children with autism (2.7-7 yearsold), 16 children with other developmental delays (2.6-7 yearsold) and 9 typically developing children (15-19 monthsold) participated. Most of children with autism performed actions which were not demonstrated. Children with other developmental delays and neurotypical copied intentional action in condition where it had a positive outcome and did not copy an intentional action and imitated action in condition where the accidental action had a positive outcome. The objects we used were designed with some extra parts, which were not demonstrated by adult, unlike the objects, used in Carpenter et al.'s (2002) study. These parts can be distracting children with autism. The main study with simplified objects will be conducted with the same groups and procedure.

PC - 048 Social group selectively trumps efficiency: Infants imitate sub-efficient actions of linguistic ingroups

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Infants selectively learn ostensively demonstrated sub-efficient actions from their linguistic ingroup members (Buttleman et al., 2013). However, when infants are given the opportunity to efficiently realize a goal by themselves first, they do not faithfully imitate those sub-efficient actions (Pinkham & Jaswal, 2011). To reconcile these findings, we suggest that self-discovered efficiency is privileged over sub-efficiency as a function of the demonstrator's social group. We hypothesize that efficiency will be prioritized over sub-efficient demonstration if it is delivered by an outgroup, but sub-efficient demonstration will triumph efficiency if it is delivered by an ingroup.

We tested 32 monolingual infants in a head-touch imitation paradigm. 18-month-olds either viewed a demonstrator speaking in their own language or in a foreign language. Later the demonstrator ostensively performed hands-free head-touch action on a touch sensitive light-box (Kiraly et al., 2013), and left the room. We allocated 20 seconds for infants and coded whether they first acted on the apparatus with their hands, and whether there was a head-touch action imitation later.

Half of the infants (n=8) in the "ingroup" condition continued lighting up the apparatus with the head despite emitting a light effect with their hands initially. In the "outgroup" condition there was only one infant acting on the light-box with her head after operating it efficiently. This difference was statistically significant ($p = .01$), replicating Buttleman et al. (2013). These findings suggest that learning

sub-efficient action manners from linguistic ingroups might be evolved to support transmission of normative and social shared knowledge within social cultural groups.

PC - 049 Names, facts or emotions: what evokes declarative points?

Tatyana Kotova

National Research University Higher School of Economics, Moscow, Russia

Liszowski et al. (2004) confirmed the hypothesis that children point to an object for sharing an impression with an adult. In the experiment, the condition with the sharing impressions was accompanied by objects naming. In Kováč et al.'s study (2014) it was proved that infants use declarative points to get new information from an adult. The study consisted of two experiments. In one experiment, the experimenter reacted by exhibiting informing and in another by sharing behavior. In a second experiment, Kovac used familiar words with new words.

As a research question of our study, we decided to clarify whether the child points to an object to find out its name since the name of the object can inform about the essence of the subject. The procedure was analogous to Kovac et al.'s study (2014). The experiment consisted of three conditions: name, emotion and fact. The experimenter labeled the object by artificial name, or evaluated it emotionally or informed provided the fact about it. In the pilot experiment 12-15-months-old infants participated. The experimenter did not react to the appearance of the toy until the infant pointed to it. After the child used this gesture, the experimenter responded to the appearance of a new object by naming it by artificial word. The measures were the same as in Kovacs et al.'s study (2014): the number and duration of the child's gestures and visual contact with the experimenter. Support is gratefully acknowledged from the Russian Science Foundation, project No: 17-18-01047.

PC - 050 The development of feature- and category-based guidance of attention in early childhood

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In a visual search task, participants search for one or more targets among distractors. Attention is guided by multiple sources, including perceptual features and higher-order categorical distinctions between target and distractors. Typically, participants are faster and more accurate in feature search than conjunction (i.e. higher-order) search (e.g. Treisman & Gelade, 1980). But how the ability to guide search emerges throughout the development of young children remains unknown. In this study, we examine differences in perceptual versus categorical guidance of search in 3- and 4-year-old children (N = 56) in a multi-target cancellation task. Good performance depends on accuracy and speed, implemented into a single measure called the quality of search score (Q-score; Hills & Geldmacher,

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1998). A repeated measures ANOVA was conducted with Q-score as outcome measure, age-group as between-subject variable and condition as within-subject variable. There was a significant effect of age-group ($F(1,54) = 58.14, p < .0001$), where the older group ($M = 1.0, SD = 0.22$) scored higher than the younger group ($M = 0.62, SD = 0.23$). While there was no main effect of condition, there was a significant interaction between condition and age ($F(1,54) = 22.77, p < .0001$). A post-hoc paired t-test revealed that the younger group performed better on the exemplar condition than the category ($t(27) = -5.6, p < .001$), but the older group did not. We conclude that the ability to guide attention through categorical templates improves rapidly between the ages of 3 and 4.

PC - 051 Fifteen-month-olds do not prefer helpers over hinderers: A failed replication of Hamlin et al. (2007)

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A conspicuous body of findings on the early foundations of sociomoral cognition suggests that, from a very young age, children not only recognize pro- and antisocial actions, but also evaluate third parties on the basis of these actions.

We conducted a replication of the seminal study by Hamlin et al. (2007), which has catalyzed this research program. The study showed that 6- and 10-month-olds exposed to a character attempting to climb a hill and being sequentially helped and hindered by two different characters consistently reached for the helper over the hinderer at test.

In our replication, we tested 15-month-olds ($n = 32$) with the same paradigm, using animated stimuli of the helping and hindering actions, kindly provided to us by Woo & Hamlin. Infants watched six trials of alternating helping and hindering scenarios. Immediately afterwards, we presented them with three-dimensional cardboard replicas of the helper and hinderer and asked "Whom do you want to play with?". As a measure of preference, we coded the infants' first visually guided touch to one of the characters. Out of the 32 participants, 16 reached for the helper and 16 for the hinderer. The present failure to replicate the original effect suggests that the conditions under which infants' preference for prosocial characters emerge may be more labile than previously assumed, and urges for more research in eliciting conditions and signature limits of infants' sociomoral evaluation.

PC.e - 052 Gaze-triggered looking-while-listening: A new method for measuring speed of processing

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Visual reaction times to target pictures after naming events are a powerful tool in language acquisition research, because gaze shifts measured in looking-while-listening paradigms (LWLP) are an

indicator of infants' lexical speed of processing. This measure is very powerful as it can be applied from the first birthday onwards and has been linked to later language development (Weisleder & Fernald, 2013). However, to obtain valid reaction times, the child is required to change their fixation from a distractor to a target object. Many trials usually have to be discarded because the participant is already fixating the target so that no reaction time can be measured. With few trials, reliability suffers, which is especially problematic when studying individual differences (e.g. 3-32 trials in Fernald & Marchman, 2012). In order to solve this issue, we developed a gaze triggered LWLP. The trials do not differ from the original paradigm apart from the fact that the target object will be chosen depending on the child's fixation just before naming. The object the child is looking at becomes the distractor and the label of the other object will be played as target, demanding the child to switch and providing a reaction time. We are currently testing our paradigm with 18-month-old children (target n = 40, n tested = 14). We also included the conventional LWLP to compare the methods within participants. Preliminary data indicate that the gaze-triggered paradigm results in more reaction time trials per child, allowing for a more reliable speed of processing measure.

BC  D



1. AKADEMIA ITALIA €€-€€€

Szent István tér 12, 1051 Budapest
Italian

2. BAMBA MARHA €€-€€€

Október 6. u. 6, 1051 Budapest
Burger bar

3. BESTIA €€-€€€

Szent István tér 9, 1051 Budapest
Fusion, Bistro

4. BÖRZE €€-€€€

Nádor u. 23, 1051
Hungarian

5. CAFÉ VIAN €€-€€€

Hercegprímás u. 15, 1051 Budapest
French, Hungarian

6. DELIBABA €

Nádor u. 19, 1051
Soups, Sandwiches, Lunch menu

7. FRUCCOLA €€-€€€

Arany János u. 32, 1051 Budapest
Salad bar, Sandwiches

8. GOVINDA €

Vigyázó Ferenc u. 4, 1051 Budapest
Indian(ish), Vegetarian

9. GUSTOLATO €€-€€€

Hercegprímás u. 13, 1051 Budapest
Italian

10. HUMMUSBAR €

Október 6. u. 19, 1051
*Middle Eastern, Sandwiches,
Hummus plates*

11. ISTANBUL KEBAB €

Október 6. u. 22, 1051
Hungarian, Turkish, Self-service, Fast food

12. KAMRA ETELBÁR €

Hercegprímás u. 19, 1051
Hungarian, Self-service

13. KISHARANG ÉTKEZDE €

Október 6. u. 17., 1051 Budapest
Hungarian

14. PAD THAI WOKBAR €

Október 6. u. 4, 1051 Budapest
Asian, Fast food

15. SALAD CONCEPT €

Hercegprímás u. 12, 1051 Budapest
Salad bar, Vegetarian

16. SOUP/PASTA CULTURE €

Október 6. u. 19, 1051
Soups, Sandwiches, Pasta

17. TERV BISZTRÓ €

Nádor u. 19, 1051
Hungarian

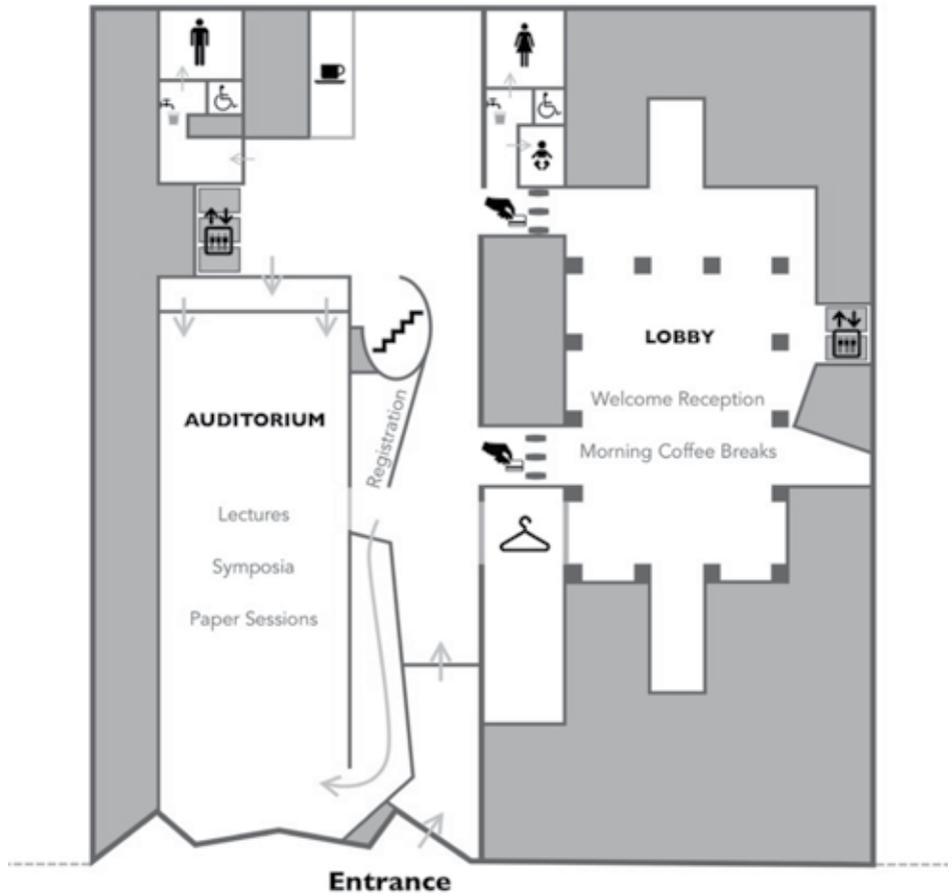
18. TRATTORIA POMO D'ORO €€-€€€

Arany János u. 9, 1051 Budapest
Italian

BC  D

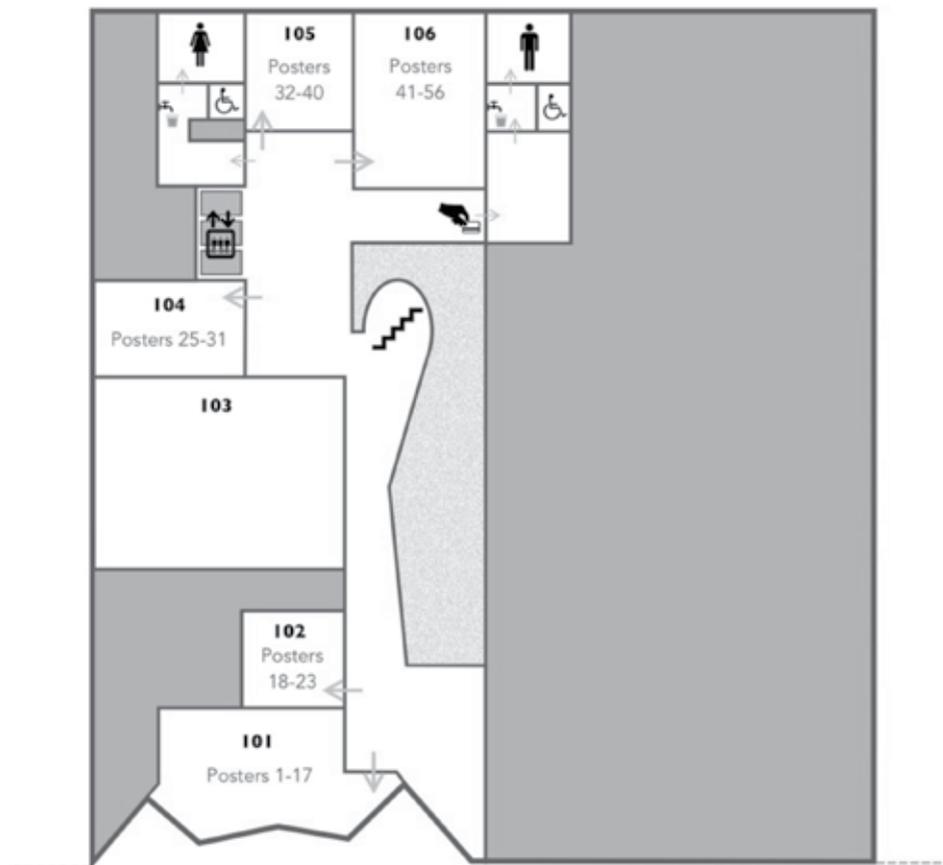


Ground Floor -- Talks



➔ *Nádor utca* ➔

First Floor -- Posters



→ *Nádor utca* →

