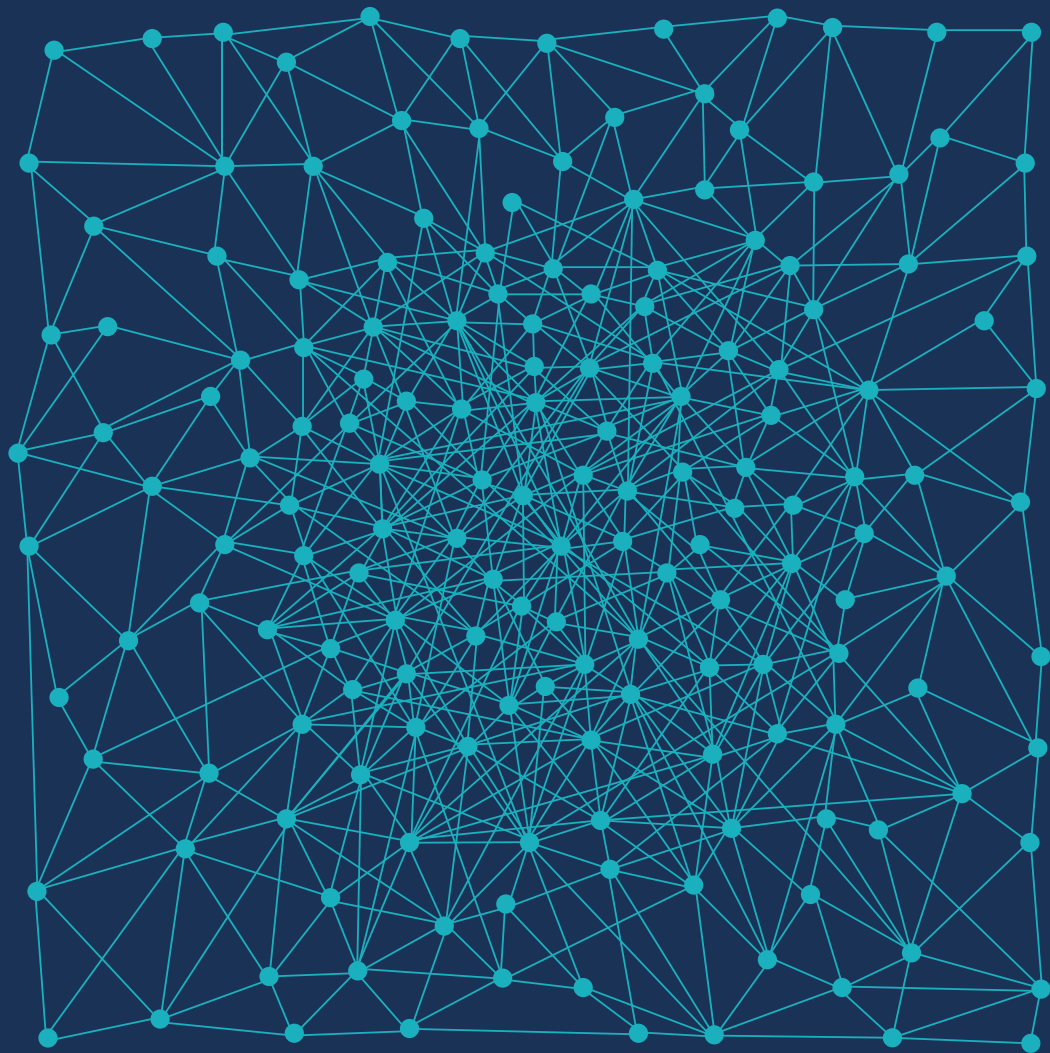




BUDAPEST  
CEU CONFERENCE  
ON COGNITIVE  
DEVELOPMENT

**2022**

PROGRAM AND ABSTRACTS



UTC +0	Monday Jan 10	Tuesday Jan 11	Wednesday Jan 12	Thursday Jan 13	Friday Jan 14	
07:00 - 08:30		<b>Virtual Presentation Session 2</b>	<b>Virtual Presentation Session 5</b>	<b>Virtual Presentation Session 8</b>	<b>Virtual Presentation Session 11</b>	
08:30 - 13:00		Break	Break	Break	Break	
13:00 - 14:30		<b>Virtual Presentation Session 3</b>	<b>Virtual Presentation Session 6</b>	<b>Virtual Presentation Session 9</b>	<b>Virtual Presentation Session 12</b>	
14:30 - 15:00		Break	Break	Break	Break	
15:00 - 15:30		<b>Opening</b>	<b>Regular Symposium 1:</b> The development of reason-responsiveness	<b>Paper Session 4:</b> Words and labels		<b>Regular Symposium 3:</b> Referential communication in human infants and non-human primates
15:30 - 16:00	<b>Paper Session 1:</b> Perspective-taking and joint action	Coffee break		<b>Paper Session 7:</b> Pragmatics		
16:00 - 16:30						
16:30 - 17:00	Coffee break	Coffee break	<b>Paper Session 5:</b> Cooperation	Coffee break	Coffee break	
17:00 - 17:30	<b>Paper Session 2:</b> Early conceptual capacities	<b>Paper Session 3:</b> Action understanding		Break	<b>Paper Session 6:</b> Decision-making	<b>Paper Session 8:</b> Social categories
17:30 - 18:00						
18:00 - 18:30	Break	Break	<b>Invited Symposium:</b> Active learning (with 10 minutes break halfway)	Break	Break	
18:30 - 19:00	<b>Invited Talk:</b> Fiery Cushman (Harvard)	<b>Regular Symposium 2:</b> Representing alternatives		<b>Regular Symposium 4:</b> Novel applications of rhythmic perceptual entrainment in infancy research	Break	<b>Invited Talk:</b> Rebecca Saxe (MIT)
19:00 - 19:30						
19:30 - 20:00						
20:00 - 20:30	Wine reception	Break		Break	<b>Virtual gala</b> dinner/lunch/ breakfast	
20:30 - 22:00	<b>Virtual Presentation Session 1</b>	<b>Virtual Presentation Session 4</b>	<b>Virtual Presentation Session 7</b>	<b>Virtual Presentation Session 11</b>		

# **BCCCD 2022**

Budapest CEU Conference  
on Cognitive Development

## Program and Abstracts

### **ORGANIZED BY**

Cognitive Development Center  
Central European University

10-14, January, 2022

<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>

## **CONFERENCE CHAIRS**

Hanna Marno

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## **SCIENTIFIC COMMITTEE**

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Assisztencia Congress Bureau

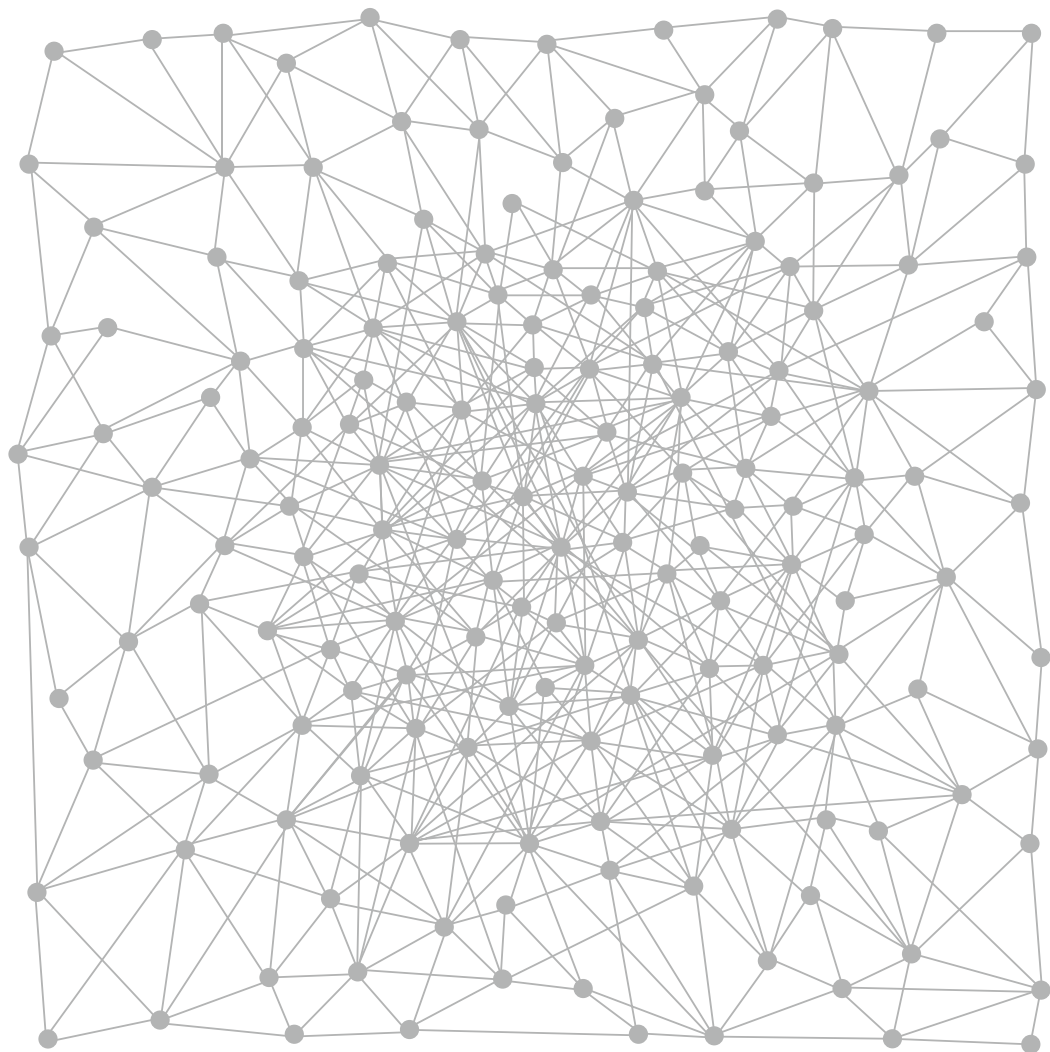
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**MONDAY, JANUARY 10**

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**15:00-15:30 UTC**    **OPENING**

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PERSPECTIVE-TAKING AND JOINT ACTION**

**16:30-17:00 UTC**    **COFFEE BREAK**

**17:00-18:00 UTC**    **PAPER SESSION 2:  
EARLY CONCEPTUAL CAPACITIES**

**18:30-20:00 UTC**    **INVITED TALK:**  
Fiery Cushman (Harvard)

**20:00-20:30 UTC**    **VIRTUAL WINE RECEPTION**

**20:30-22:00 UTC**    **VIRTUAL PRESENTATION SESSION 1**



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**13:00-14:30 UTC VIRTUAL PRESENTATION SESSION 3**

**15:00-16:30 UTC REGULAR SYMPOSIUM 1:  
THE DEVELOPMENT OF  
REASON-RESPONSIVENESS**

**16:30-17:00 UTC COFFEE BREAK**

**17:00-18:00 UTC PAPER SESSION 3:  
ACTION UNDERSTANDING**

**18:30-20:00 UTC REGULAR SYMPOSIUM 2:  
REPRESENTING ALTERNATIVES**

**20:30-22:00 UTC VIRTUAL PRESENTATION SESSION 4**

**WEDNESDAY, JANUARY 12**

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**13:00-14:30 UTC**    **VIRTUAL PRESENTATION SESSION 6**

**15:00-16:00 UTC**    **PAPER SESSION 4:  
WORDS AND LABELS**

**16:00-16:30 UTC**    **COFFEE BREAK**

**16:30-17:30 UTC**    **PAPER SESSION 5: COOPERATION**

**18:00-20:30 UTC**    **INVITED SYMPOSIUM:  
ACTIVE LEARNING**

**20:30-22:00 UTC**    **VIRTUAL PRESENTATION SESSION 7**

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**13:00-14:30 UTC**    **VIRTUAL PRESENTATION SESSION 9**

**15:00-16:30 UTC**    **REGULAR SYMPOSIUM 3:  
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IN HUMAN INFANTS AND  
NON-HUMAN PRIMATES**

**16:30-17:00 UTC**    **COFFEE BREAK**

**17:00-18:00 UTC**    **PAPER SESSION 6: DECISION-MAKING**

**18:30-20:00 UTC**    **REGULAR SYMPOSIUM 4:  
NOVEL APPLICATIONS OF RHYTHMIC  
PERCEPTUAL ENTRAINMENT  
IN INFANCY RESEARCH**

**20:30-22:00 UTC**    **VIRTUAL PRESENTATION SESSION 10**

**FRIDAY, JANUARY 14**

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**13:00-14:30 UTC**    **VIRTUAL PRESENTATION SESSION 12**

**15:30-16:30 UTC**    **PAPER SESSION 7: PRAGMATICS**

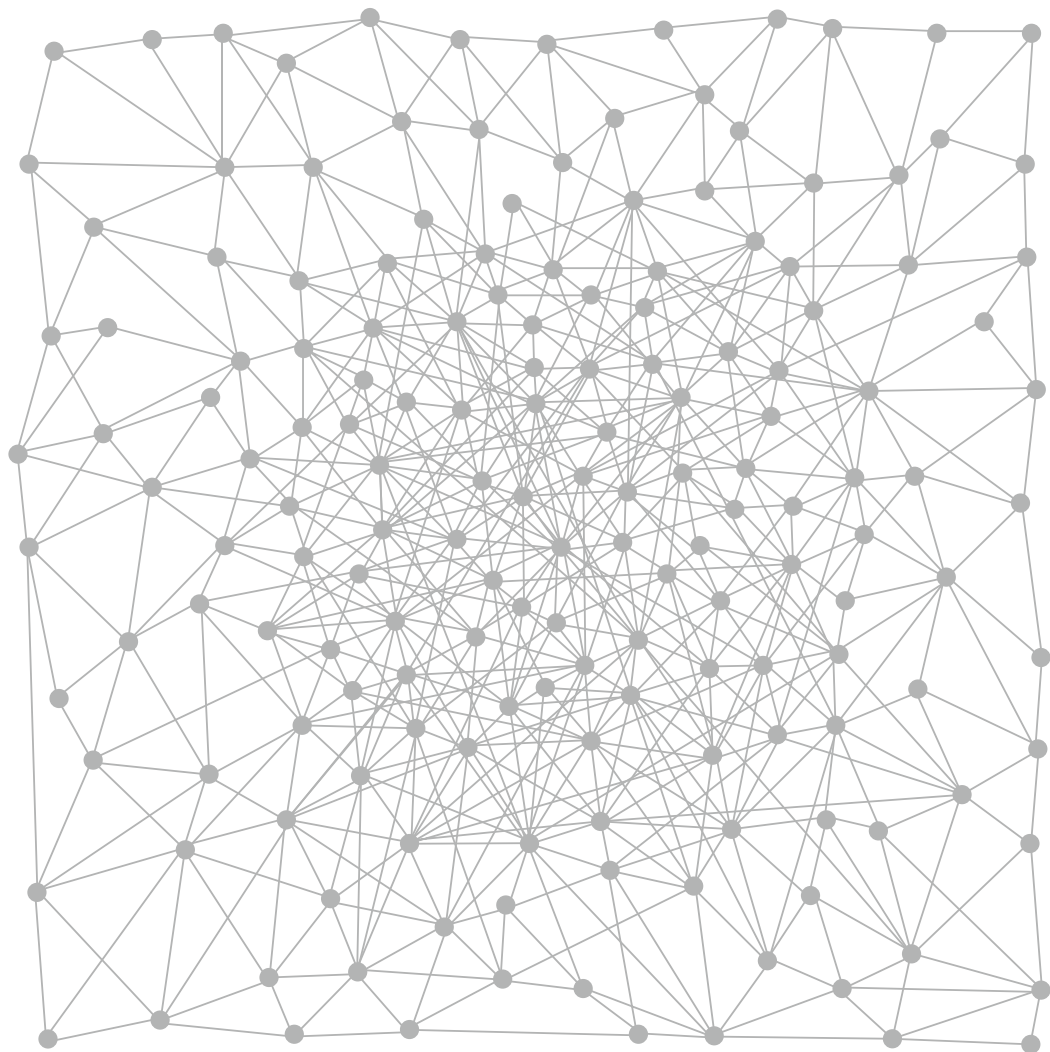
**16:30-17:00 UTC**    **COFFEE BREAK**

**17:00-18:00 UTC**    **PAPER SESSION 8: SOCIAL CATEGORIES**

**18:30-20:00 UTC**    **INVITED TALK:**

Rebecca Saxe (MIT)

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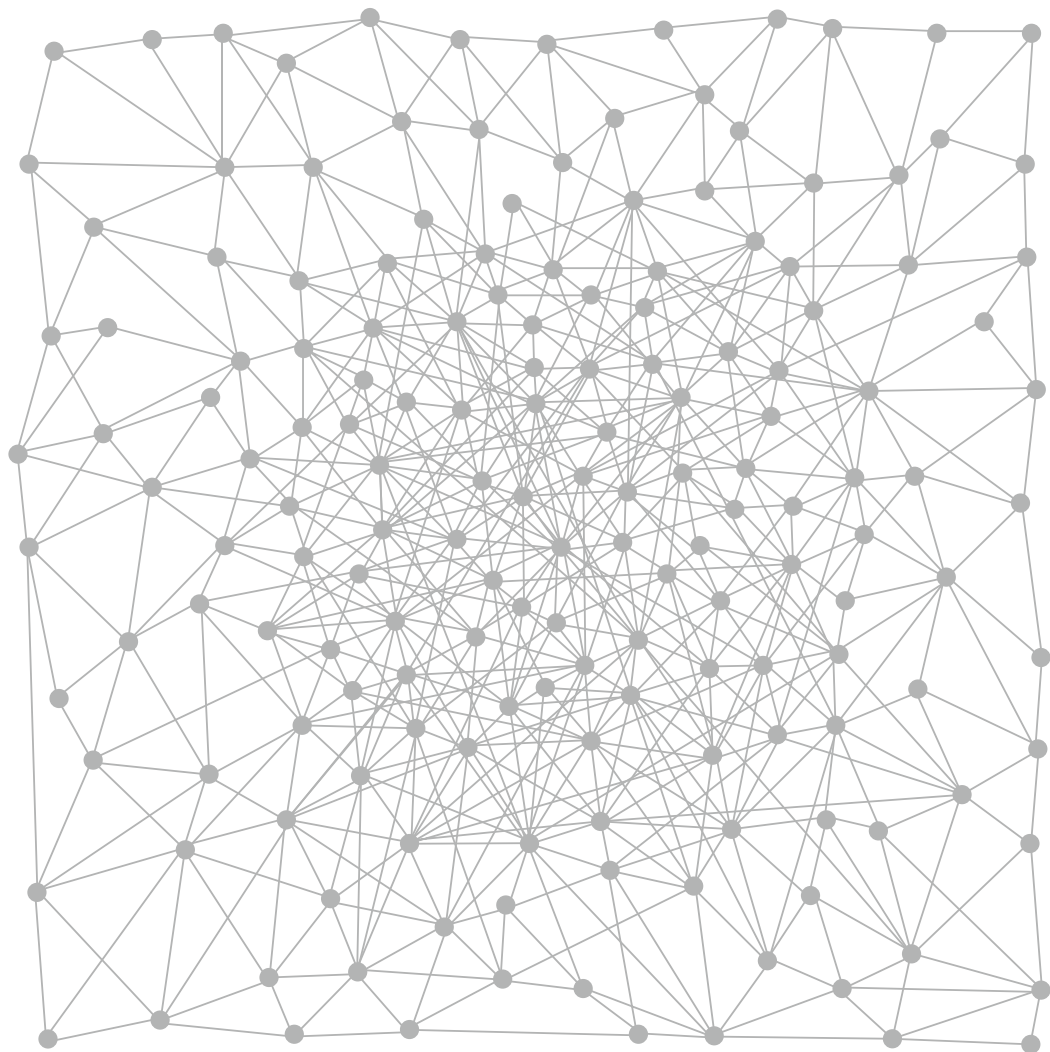


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# INVITED TALK 1

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## How we know what not to think

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Monday, January 10, 18:30 – 20:00 UTC

**Fiery Cushman**

Harvard University

In the real world, there is far too much to think about. This is remarkably understudied in laboratory contexts, however, where the study of decision-making is typically limited to small “choice sets” defined by an experimenter. In these contrived cases an individual may devote considerable attention to each item in the choice set. But ordinarily we are often not presented with defined choice sets; rather, we must construct a viable set of alternatives to consider. I will present several recent and ongoing research projects that each aim to understand how humans spontaneously decide what actions to consider—in other words, how we construct choice sets. A common theme among these studies is a key role for cached value representations. Additionally, I will present some evidence that moral norms play a surprisingly and uniquely large role in constraining choice sets and, more broadly, in modal cognition (i.e., reasoning about what is possible, likely, or desirable). This suggests a new avenue for understanding how morality influences our thought and behavior.

PLENARY SESSIONS  
INVITED TALKS

<https://bcccd.slack.com/archives/C02Q27T0FF1>

## INVITED TALK 2

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### **Infants' brains are specialized for social functions**

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Friday, January 14, 18:30 – 20:00 UTC

**Rebecca Saxe**

MIT

In this talk, I will argue that human infants have distinct social representations and motivations. Infants' learning about, and representations of, other people are not just a downstream consequence of generic processes that promote learning in the nonsocial environment, nor are they built by gradual, bottom-up adjustment to the statistics of visual experience. On the contrary, infants' attention to people depends on specific inferences about their social relevance; and is related to activity in distinctively social brain regions.

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## INVITED SYMPOSIUM

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### **Active learning: computational, neural and developmental perspectives**

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Wednesday, January 12, 18:00 – 20:30 UTC

Active learning, that is, the capacity to adaptively evaluate and seek out information is receiving renewed attention within the broadly defined cognitive sciences (including neuroscience and AI research). Key questions within this field concern the determinants of what variables will be the targets of subjects' interest, how possible information gathering actions (including questioning) are generated, and how the outcomes of these actions get evaluated in terms of information gain. From a developmental perspective, these issues are closely related to classical topics, such as the origin and structure of hypotheses, the motivations behind children's learning, the refinement of causal models by intervention, or the development of interrogative linguistic behavior. The symposium brings together experts on active learning who study different aspects of this capacity.

PLENARY SESSIONS  
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## The emergence and developmental trajectory of active and ecological learning

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**Azzurra Ruggeri**

Max Planck Institute for Human Development, Technical University Munich, Central European University

This talk will introduce the Ecological Learning framework, which focuses on children's ability to adapt and tailor their active learning strategies to the particular structure and characteristics of a learning environment. In particular, I will present the results of several seminal studies indicating that efficient, adaptive search strategies emerge around 3 years of age, much earlier than previously assumed. This work highlights the importance of developing age-appropriate paradigms that capture children's early competence to gain a more comprehensive and fair picture of their active learning abilities. Also, it offers a process-oriented theoretical framework that can accommodate and reconcile a sparse but growing body of work documenting children's active and adaptive learning.

## Knowledge is power, but how do people decide what to know?

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**Irene Cogliatti Dezza**

University College London, Ghent University

A vast amount of information is nowadays available to people. This includes information that impacts people's well-being and mental health. People thus need to make frequent decisions about which information they would like to receive and which they would rather avoid. However, little is known about how people make such decisions. For example, studies have suggested that information is valuable similar to typical rewards. Does this mean that people decide to seek or avoid information in the same fashion as they seek rewards and avoid punishments? Additionally, as information can impact the way people feel, think and act, do people consider this impact when deciding what to know? In this talk, I will outline my recent work which attempts to better understand how people decide which information to seek and which to avoid through a combination of computational modeling, neuroimaging, and behavioral studies.

PLENARY SESSIONS  
INVITED SYMPOSIUM

## **A computational perspective on the intertwined nature of sensing, acting, and learning**

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**Constantin A. Rothkopf**

Technical University of Darmstadt

In everyday naturalistic tasks, i.e. sequential behavior beyond single trial forced choice laboratory experiments, perception, action, and learning are inseparably intertwined. The reason is that an action can directly contribute to task achievement such as obtaining a reward or fulfilling an instructed experimental goal, or it can contribute to changing the subject's belief about the state of the world, thereby contributing indirectly to task fulfillment in the future. Sequential actions involving perceptual uncertainty, action variability, internal and external costs and benefits can be understood and modeled in the unified framework of sequential decision making under uncertainty. In this framework, active perception, active learning, curiosity and several other psychological phenomena are readily understandable and do not need to be conceptualized as separate processes. The active nature of sensation and learning can be established by inverse modeling, i.e. by recovering the internal beliefs and subjective costs of a subject from observed behavior.

The talk will present several studies combining behavioral experiments with computational modeling based on this framework.

## The complex paths to active learning: more than meets the eye

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**Jacqueline Gottlieb**

Columbia University

When scientists carve out cognition to study it in the laboratory, they typically assume that “information” comes first. In laboratory experiments, people choose actions based on given sensory stimuli; in computational models, a stimulus starts a chain of events culminating in perception and actions. And yet, it is also well known that the subjective feeling that information is “given” to us is merely an illusion. Raw sensory signals are meaningless and must be extensively interpreted to be behaviorally useful; moreover, these signals are far too numerous to be processed in full. In natural settings, therefore, motivation comes first. People, like all physical agents, must first decide what the relevant stimulus is and sparsely query their environments based on their motivation and needs. This raises a question that is foundational for all cognitive functions ranging from childhood development to sub-second decisions about shifts of gaze: how do people organize information demand, and do they choose the most informative stimuli? I will describe studies showing that, in humans and non-human primates, information demand is sensitive to learning progress and expected information gains, consistent with the theoretically optimal (Bayesian) minimization of uncertainty. However, information demand also shows maladaptive biases, often produced by rewards, that lead to sub-optimal actions based on less informative stimuli. Building on the fields’ extensive background knowledge about the physiology of attention, we are unraveling how these modes of information demand are orchestrated by activity across the executive and fronto-parietal networks.

PLENARY SESSIONS  
INVITED SYMPOSIUM

## REGULAR SYMPOSIUM 1

### The development of reason-responsiveness – How children learn to evaluate and respond appropriately to reasons communicated by others

Tuesday, January 11, 15:00 – 16:30 UTC

**Chair:** Antonia Langenhoff, University of California, Berkeley

**Co-chair:** Hanna Schleihauf, University of California, Berkeley

**Discussant:** Michael Tomasello, Duke University

Humans, in contrast to other animals, reason interactively. Exchanging reasons with others can be a powerful tool to circulate reliable information, increase community connection, and foster consensus. However, its success critically depends on the collective reasoning skills of the broader community. One important reasoning skill that participants of public discourse must display is reason-responsiveness - the ability to evaluate and respond appropriately to reasons communicated by others. Some key aspects of reason-responsiveness are that individuals must 1) adjust their beliefs rationally in light of reasons, 2) draw appropriate conclusions about others based on the reasons they give, and 3) decide which reasons to pass on to others. In this symposium, researchers from three international labs investigate the development of these key aspects of reason-responsiveness.

The first contribution investigates children's ability to form beliefs based on reasons in three increasingly complex situations. A first study reveals that children prefer strong over weak reasons when they have no prior belief about the true state of the world. A second study demonstrates that children rationally integrate the strength of reasons for their prior beliefs with the quality of reasons for new alternative beliefs when making up their minds. A third study shows that children readily revise their beliefs when they learn that the initial reasons favoring these beliefs were invalid.

The second contribution focuses on the moral judgments that children make about other agents based on the reasons these agents give. In a first study, children preferred to interact with agents whose apologies for a moral transgression were accompanied with reasons indicating that their action was based on a misleading belief over agents who did not provide any reasons. In a second study, children preferred agents who apologized with reasons that were morally acceptable over agents who gave morally unacceptable reasons that did not respect the feelings of the victim.

The third contribution complements the picture by building a bridge between reason-responsiveness and reason-giving. Which reasons do children base their own beliefs on? And which reasons do children state when justifying their own beliefs or when convincing others to change their minds? The study shows that the reasons that children find convincing are not necessarily the reasons that they are motivated to share with others. Irrespective of which reasons they based their beliefs on initially, children mostly relied on perceptual reasons to justify their beliefs or to convince someone to believe them.

Collectively, this symposium illuminates multiple crucial aspects of the development of reason-responsiveness – a key critical thinking skill for participating in rational discourse. Our discussant will provide an integrative synthesis, highlighting different theoretical frameworks and illustrating how becoming reasonable represents the culmination of uniquely human cognition.

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## How children revise their beliefs in light of reasons

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**Hanna Schleihauf, Jan Engelmann**

University of California, Berkeley

Here, we investigate how reason-responsiveness – the ability to respond appropriately to reasons provided in discourse – develops in young children. In Study 1 (N=58, 26 girls), 4- and 5-year-old children selectively attended to good over bad reasons, whereas 3-year-old children did not show such receptivity. The results of Study 2 (N=131, 64 girls) indicate that 4- and 5-year-old children revise their beliefs in selective ways: they consider both the strength of the evidence for their initial beliefs as well as the quality of reasons provided by a social partner for an alternative view when deciding whether or not to revise their rationale. In Study 3 (N=80, 42 girls, pre-registered) children consider meta-reasons (reasons about reasons) when deciding whether to revise their beliefs. When children formed an initial belief based on a reason and were then confronted not only with a strong reason for an alternative belief, but also a meta-reason that spoke against their initial reason, they changed their minds on most trials. In contrast, when the meta-reason supported the children's initial reason, they mostly maintained their initial belief. These results suggest that by age 4, children possess key critical thinking capacities for participating and exchanging reasons in public discourse.



## Young children value reasons for belief-based accidents

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Owen Waddington<sup>1</sup>, Marina Proft<sup>2</sup>, Keith Jensen<sup>1</sup>, Bahar Köymen<sup>1</sup>

<sup>1</sup>University of Manchester, UK; <sup>2</sup>University of Göttingen, Germany

Transgressors seek forgiveness through apologies, explaining or providing reasons for how their transgressions were accidents. There are intent-based accidents in which both the act and the outcome are not intended (falling over and breaking a cup) and belief-based accidents in which the act is intended but the outcome is not (disposing of someone's picture believing it was trash). Providing good reasons for belief-based accidents is crucial because it is often unclear why these are accidents.

In Study 1, 4- and 5-year-old children witnessed two transgressors ripping someone's picture by accident: one transgressor only apologised ("I'm sorry") and the other apologised and provided a reason (e.g., "I'm sorry, I thought this was my picture"). In the accidental condition, both accidents were intent-based (the transgressor did not mean to rip the picture). In the intentional condition, they were belief-based (the transgressor meant to rip the picture, but did not mean to rip her friend's picture). Five-year-olds, but not 4-year-olds, preferred to help, play with, and trust the transgressor who apologised with a reason in the intentional condition, but showed no preference for either in the accidental condition.

In Study 2, children heard one transgressor give a "good" reason and another give a "bad" reason for the same transgression ("I thought this was my picture" vs. "I thought this picture was not good"). Children preferred the transgressor who gave a 'good' reason over the other. Thus, children appreciate when reasons should accompany apologies and also account for the quality of these reasons.

## **Dissociation between what convinces children, and the reasons they use to convince others**

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**Thomas Castelain<sup>1</sup>, Hugo Mercier<sup>2</sup>**

<sup>1</sup>Université de Neuchâtel, Switzerland; <sup>2</sup>CNRS, France

From early on, children are sensitive to the strength of the arguments they are exposed to. By the age of 5 at least, they are also able to produce reasons adapted to the context. However, little is known about young children's ability to use evidence they have acquired, or the arguments that have convinced them, to convince others in turn. As a first investigation into this issue, we showed children (N = 180, Mage = 71.27 months) hybrid pictures, and attempted to convince them that it depicted the less likely entity through various means (e.g. Expertise, Consensus, Argument of expertise, Argument of consensus and Perceptual argument). The children were then introduced to a puppet with whom they were invited to share this new belief. Depending on the condition, children had to: (i) report what they were exposed to, (ii) justify how they had acquired the new belief, or (iii) convince the puppet to accept this new belief. The results suggested that children were able to accurately recall the source and the information they had been exposed to. By contrast, when they were asked to justify their answers, or to convince someone else, they mostly relied on perceptual arguments, irrespective of how they themselves had been convinced. It thus seems that children have a tendency to produce perceptual arguments as reasons, irrespective of how they acquired a belief. Interestingly, the same pattern has been observed in adults in a variety of settings. Tentative explanations for this phenomenon are offered.

## REGULAR SYMPOSIUM 2

### Representing alternatives

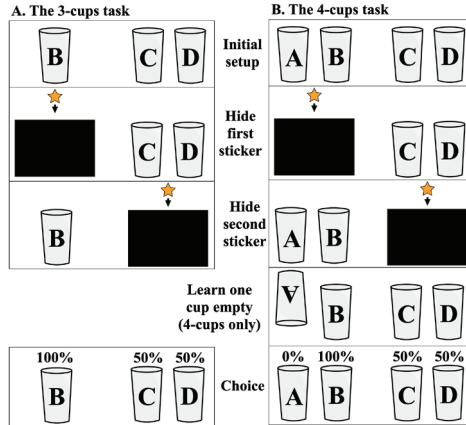
Tuesday, January 11, 18:30 – 20:00 UTC

**Chair:** Brian Leahy, Harvard University

**Discussant:** Jonathan Phillips, Dartmouth College

Some cognitive states represent the world as it is. Others represent the ways the world might be and might not be. This symposium discusses the ontogenetic and phylogenetic origins of the ability to represent alternatives, i.e., incompatible versions of a single reality. Each presentation reports a version of the 3- or 4-cups task (Mody & Carey 2016, see figure), the most widely used and most influential measure of the ability to represent alternatives. Participants see two sets of cups. One set is occluded while a sticker is hidden; then the other set is occluded while another sticker is hidden. In 4-cups trials, one cup is shown empty. Participants choose one cup and receive its contents. This tests whether participants reason through the disjunctive syllogism (Sticker 1 is in A or B; it's not in A; therefore it's in B), along with the ability to contrast what is the case (there's a sticker in B) with what might be the case (sticker 2 might be in C or D). Two unexpected results were: (1) Performance is above chance by age 2.5 but remains close to 50% until age 4; (2) Performance on both tasks is equally bad; there is no cost to the negation inference in the 4-cups task. Whatever is difficult about the task is present in the 3-cups version. One interpretation is that 2.5- and 3-year-olds lack concepts like 'or' and 'might' that let them understand that sticker 2 might be in C or D. Lacking this, they make an assumption about sticker 2's location; they consequently "know" where each sticker is, and choose randomly between each location that is "known" to hold a sticker. Paper 1 extends these tasks to chimpanzees, including the first implementation of the 3-cups task with nonhumans. Chimpanzees performed like 3-year-olds. This is expected if chimpanzees are making assumptions about sticker 2's location, though other interpretations are also available. Paper 2 modifies the 3-cups task. When 3-year-olds are asked to throw a cup away and receive the contents of both remaining cups, they almost always throw away from the 2-cup side. When asked to throw away a cup and then pick one of the remaining cups, they throw away from the 2-cup side and then choose at random between the two remaining cups. This is expected if participants have beliefs about where each sticker is. Paper 3 questions this interpretation. Marrying the logic of the 3-cups task with the framing of probability tasks that even 12-month-olds

solve, 3-year-olds reliably make wise decisions: they choose an option that will pay over one that merely might pay. Perhaps 3-year-olds' probability concepts underwrite the ability to represent incompatible possibilities. Researchers have converged on the cups task as a measure of the ability to represent alternatives. Different applications of the paradigm, however, have generated different conclusions. This symposium puts these divergent positions in timely discussion.



PLENARY SESSIONS  
REGULAR SYMPOSIA

<https://bcccd.slack.com/archives/C02QK53H892>

## Do Chimpanzees Reason According to the Disjunctive Syllogism?

Jan Engelmann<sup>1</sup>, Lou Haux<sup>2</sup>, Hanna Schleichauf<sup>1</sup>, Christoph Völter<sup>3</sup>, Josep Call<sup>4</sup>, Hannes Rakoczy<sup>5</sup>, Esther Herrmann<sup>6</sup>

<sup>1</sup>University of California, Berkeley; <sup>2</sup>Max Planck Institute for Human Development; <sup>3</sup>Messerli Research Institute; <sup>4</sup>University of St. Andrews; <sup>5</sup>University of Göttingen; <sup>6</sup>University of Portsmouth

Psychologists disagree about the development of logical concepts such as or and not. While some theorists argue that even prelinguistic infants reason logically, others maintain that logical inference is contingent on linguistic abilities and emerges around age 4. We contribute to this discussion by studying logical reasoning in one of our closest living relatives Chimpanzees (N=16) consecutively participated in four experimental studies: two-cup task, three-cup task, and two different versions of the four-cup task: reveal empty, as in Figure 1; reveal baited, in which the participant observes bait being removed from one cup (Gautam, Suddendorf, & Redshaw, 2021). For the two versions of the four-cup task, subjects also participated in a control condition in which there were no visible cup pairings. Study design, procedure, and analyses were pre-registered. Analyses are ongoing, but preliminary results are that chimpanzees performed significantly above chance in the two-cup task, 95% correct,  $p < 0.001$ . Chimpanzees did not perform significantly above chance in the three-cup task, 51% correct,  $p = 0.757$ . In the reveal-empty version of the four-cup task, chimpanzees chose the correct cup (the cup in the same pair as the empty cup) more often in the test (48%) compared to the control condition (29%),  $p = 0.003$ . In the reveal-baited version of the four-cup task, chimpanzees chose the pair not containing the baited cup more often in the test (85%) compared to the control condition (75%),  $p = 0.047$ . I will discuss the extent to which these results present evidence for logical reasoning in chimpanzees.

## 3-year-olds don't distinguish what might be from what is

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**Brian Leahy<sup>1</sup>, Michael Huemer<sup>1,2</sup>, Susan Carey<sup>1</sup>**

<sup>1</sup>Harvard University; <sup>2</sup>University of Salzburg

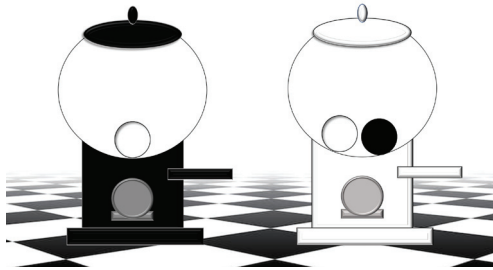
Adults distinguish what will happen from what might and might not happen. They employ possibility concepts, which attach to a proposition to mark it as merely possible. When do possibility concepts develop? The 3-cups task suggests that three-year-olds conflate possibilities and actualities. They choose cups that might pay off over cups that will pay off almost half of the time. Study 1 replicates this finding. Study 2 rules out simple explanations for this 50% performance by asking children which option they do not want; they receive the contents of the remaining cups. Three-year-olds almost always throw away one of the risky cups, thereby maximizing their expected reward. This behavior is consistent with two hypotheses: (1) children without possibility concepts make assumptions about each sticker's location, and throw away the "empty" cup; (2) Their possibility concepts are activated by thinking about which cup they don't want. Study 3 tests these hypotheses by asking children to first throw away a cup and then choose one of the remaining cups. Again, children almost always throw away a risky cup; but after doing so they pick the sure thing only half of the time. This pattern of results is expected if 3-year-olds conflate what might happen with what will happen. Unable to mark propositions as merely possible, yet constrained to keep their models consistent, the best they can do is to find one possibility and treat it as actuality.

## The relationship between probability and possibility judgements

Stephanie Alderete<sup>1</sup>, Fei Xu<sup>2</sup>

<sup>1</sup>Harvard University; <sup>2</sup>University of California, Berkeley

What is the relationship between probability judgments and possibility judgements? Six- to 12-month-old infants can use probability to infer outcomes (Denison & Xu, 2019; Teglas et al. 2007). However, it is unclear whether infants and young children also employ modal concepts (i.e., multiple possibilities). Leahy and Carey (2020) argued that children under 4 lack modal concepts. Rather, these children only run one simulation, which they dubbed “the minimal representation of possibility.”



PLENARY SESSIONS  
REGULAR SYMPOSIA

The research on probability and possibility raises the question of how children could succeed in probabilistic, but not at possibility judgement tasks. Our study aimed to see if children could use modal concepts on a task similar to previous probability studies. Our task had the same logical structure as the 3-cups task by Mody and Carey. In our study, children had to choose between, e.g., a gumball machine with one pink gumball and a gumball machine with one pink and one black gumball, with the goal of getting a pink gumball. Children chose the correct gumball machine 92% of the time, significantly more than chance (50%) and significantly more than expected if children are making an assumption about which color gumball they will get from the machine with two gumballs (75%;  $p$ 's < .001). This supports the idea that 3-year-old children can use probability to quantify possibilities and may employ modal concepts. It also raises the possibility that children can consider multiple possibilities in tracking objects, but not at tracking locations, as required by the 3-cups task.

## REGULAR SYMPOSIUM 3

### Referential communication in human infants and non-human primates

Thursday, January 13, 15:00 – 16:30 UTC

**Chair:** Elena Luchkina, Northwestern University

**Co-chair:** Manuel Bohn, Max Planck Institute for Evolutionary Anthropology

**Discussant:** Gergely Csibra, Central European University

Human languages permit us to call to mind objects, events, and ideas that we cannot witness directly (Deacon, 1997). This ability of language to refer to perceptually unavailable things substantially broadens our communicative inventory and amplifies our ability to transfer knowledge across time and space. It enables us to learn about people we have never met, make novel inquiries, request objects and resources we have not seen, complete tasks that have not been completed before, etc. What facilitates this referential communicative power of language?

One component of referential communication must be tied to the ability to link words (or other symbols) and mental representations (e.g., Ganea & Saylor, 2013; Luchkina & Xu, 2021). This link is necessary because in the absence of perceptual information about the referent of a word, one must be able to retrieve (or establish) a mental representation of that referent. Another component must be tied to the ability to produce and interpret intentional communicative acts and integrate contextual cues into such interpretation (e.g., Csibra, 2010; Senju & Csibra, 2008). This ability is necessary to recognize communicative acts within a larger set of behaviors, to consider available information to deduce the target of communication, and to interpret referentially ambiguous utterances and actions. Both components have been found to varying degrees and human and non-human species (e.g., Bohn et al., 2015; Lyn & Savage-Rumbaugh, 2000). However, the power of human languages to effectively communicate about hidden, absent, and abstract things, while taking into account contextual and social cues, stands out relative to other species' communicative systems (e.g., Savage-Rumbaugh et al., 1993). One possibility is that linguistic reference rests upon uniquely human capacities, innate or acquired via social interactions within human communities. Another possibility is that this capacity is shared with other species, which would suggest a common evolutionary origin. These possibilities are not necessarily mutually exclusive and may both be true, but few research paradigms support



direct comparison of human and non-human communicative systems. Thus, questions about the origins of referential communication and the role of both components in its development remain.

To address these questions, Presenter 1 will focus on the recent findings demonstrating that 12-month-old infants take into account physical context, such as object accessibility, to interpret reference to hidden objects. Presenter 2 will report findings on 15-month-olds' ability to create novel mental representations of objects they had never seen before, using semantic priming, and map such representations to novel words. Finally, Presenter 3 will discuss empirical findings demonstrating commonalities in infants' and great apes' ability to produce requests for absent objects. Presenter 3 will then introduce a novel computational framework that formalizes communication in great apes and relies on information contained in the signal, the relationship between communicative partners, and the social context. This framework will provide a segue to the broader discussion on learned and innate mechanisms that enable referential communication.

<https://bcccd.slack.com/archives/C02QK55GS2Y>

## Perception, representation and absent reference comprehension at 12 months

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**Maria Osina, Amy Needham, Megan Saylor**

Vanderbilt University

Near their first birthday, infants begin to respond to the mention of hidden absent objects. Emergence of this skill coincides with concomitant increases in locomotor abilities and understanding of space and objects. We investigate whether responding to references to absent things is dually influenced by representations of out of view objects and perception of environmental affordances. In a first study, infants' (N=32) were less likely to respond to references to inaccessible out-of-view objects (versus visible out of reach objects). In a second experiment, we confirm that infants' lack of responding to out-of-reach hidden objects is best explained by representations of referents and not with difficulty responding to references above eye-line: infants (N=32) responded robustly when previously inaccessible hidden objects were moved to accessible locations before the request but failed to respond when the reverse occurred. This suggests that infants tracked the hidden object's location and updated its accessibility as it changed. In subsequent experiments (N=56), we demonstrated that infants responded to references to a hidden inaccessible object if they were provided with the means of accessing it. Infants were more likely to look at, point at, or approach an object hidden on top of a cabinet when there were stairs leading to its location. We also demonstrated that this effect was not obtained due to perceptual highlighting or increased arousal. These studies highlight a link between infants' motoric representations and their absent reference comprehension.

## Semantic priming supports infants' ability to learn names of unseen objects

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Elena Luchkina, Sandra Waxman

Northwestern University

A fundamental feature of human languages is that they permit us to call to mind objects, events, and ideas that we cannot witness directly. This capacity rests upon the referential status of words – a link between words and mental representations of their referents. When do infants achieve this recognition and what measure would suggest that infants have established a robust link between words and mental representations?

To address these questions, we leveraged infants' sensitivity to semantic priming and evaluated infants' ability to learn the name of an object while it was not visible. Fifteen-month-olds watched an actor who first named three familiar visible objects and then ostensibly looked toward and labeled a non-visible object ("A modi!"). In the Priming condition (N=24) all familiar objects were from the same semantic neighborhood (e.g., three fruits). During test, a novel object from the same semantic neighborhood and a semantically distant object were presented. Infants were prompted to look at the object corresponding to the newly learned word ("Find the modi"). In the No Priming condition (N=24) familiar objects were semantically distant from each other.

Our results indicate that only in the Priming condition, the presentation of familiar word-object pairs enabled infants to constrain the range of possible referents of the novel word to items in the same semantic neighborhood. This suggests that 15-month-olds are capable of mapping words onto mental representations and might indeed be using semantic neighborhood priming to create such representations in the absence of a novel word referent.

PLENARY SESSIONS  
REGULAR SYMPOSIA

## Exploring a common computational framework to study the evolution and development of human communication

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**Manuel Bohn<sup>1</sup>, Katja Liebal<sup>2</sup>, Michael Henry Tessler<sup>3</sup>**

<sup>1</sup>Max Planck Institute for Evolutionary Anthropology; <sup>2</sup>Leipzig University; <sup>3</sup>MIT, DeepMind

Human communication has been described as a contextual social inference process: listeners use utterances and social-contextual information to make inferences about speakers' underlying intentions. Research into great ape communication has been inspired by this view to look for the evolutionary roots of the social and cognitive processes involved in human communication. This approach has been highly productive, yet it is often compromised by a too-narrow focus on how great apes use and understand individual signals. We will present a computational framework that formalizes great ape communication as a multi-faceted social inference process. This model makes accurate qualitative and quantitative predictions about real-world communicative interactions between semi-wild-living chimpanzees. When enriched with a pragmatic reasoning process, the model can be used to explain repeatedly reported differences between humans and great apes in the interpretation of ambiguous signals (e.g. pointing gestures).

Importantly, the same modeling framework can be used to study word learning in young children. In a series of studies, the model makes accurate predictions about how children integrate multiple information sources when making inferences about the meanings of novel words - both on a group as well as on an individual level. Furthermore, the model allows us to test competing theories about the development of this integration process. Taken together, our approach provides a new tool kit for studying the evolution of human communication. It illustrates some deep similarities between the ways in which humans and great apes communicate, but also specifies in what ways human communication might be unique.

## REGULAR SYMPOSIUM 4

**Novel applications of rhythmic perceptual entrainment in infancy research**

Thursday, January 13, 18:30 – 20:00 UTC

**Chair:** Moritz Köster, Freie Universität Berlin, Germany

**Co-chair:** Charlotte Grosse Wiesmann, Max Planck Institute for Human Cognitive and Brain Sciences, Leipzig, Germany

The first years mark a period of intense brain maturation. Yet, neural mechanisms that underly human brain development are not well understood. Rhythmic perceptual entrainment methods are promising tools to overcome limitations in the study of human brain development, due to their high signal to noise ratio, their capacity to experimentally manipulate rhythmic brain activity, and other unique features. Their renaissance in developmental research has led to exciting new applications and insights in the recent years and will likely advance our understanding of human early brain development in the years to come. This symposium brings together four distinct applications of rhythmic perceptual entrainment in the visual domain. The first presentation will introduce the field and the potentials of the entrainment approach, based on seminal work on early visual categorization research. These studies reveal compelling evidence that the infant brain is already capable of creating a category from visual items that are very different from each other (e.g., faces), but also efficiently distinguishes these items from other items that do not belong to this category (e.g., objects). The second talk reports a study showing that visual categorization is tuned by olfaction in early infancy. 4-month-old infants were exposed either to a baseline odor or to their mother's body odor. Various natural images of objects are presented at a 6-Hz rate were interleaved by objects of the same categories but faces every 6th stimulus (i.e., 1 Hz). Results reveal a neural categorization response to facelike stimuli at 1 Hz in the EEG, over occipito-temporal regions. Critically, in the presence of maternal body odor, this facelike-selective response largely increases and becomes right-lateralized. The third talk reports the altercentric modulation of neural object processing in adults and infants. The authors used the entrained neural response (SSVEP) as a neural marker of object processing, to test whether adults' and infants' object processing is altercentrically modulated by what others can see. Participants were presented with an agent observing a flickering object disappearing either into a tunnel

(no visual access for the agent nor the participant) or behind an occluder (visual access only for the agent). As hypothesized, adults (N=40) showed a higher SSVEP amplitude when the agent continues to see the object (occluder condition) compared to when the agent can no longer see it (tunnel condition). The results from 12- to 14-month-old-infants (currently analyzed) will also be presented. The fourth talk reports culture-specific visual processing in the infant brain: By tagging the object and background of a scene at different frequencies, distinct brain responses are elicited for object and background. This allows the authors to show that the visual cortex of 11-month-olds from Kyoto showed a higher amplitude for the background signal, while 11-month-olds from Vienna showed a higher amplitude for the object signal. This difference is likely explained by cross-cultural differences in maternal pointing. Taken together, we hope to represent the exciting versatility of recent applications of rhythmic perceptual entrainment to guide our understanding and future research on human early brain development.

**<https://bcccd.slack.com/archives/C02QK56BN3E>**

## Brain rhythms as a doorway to the infancy of the human brain

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**Adélaïde de Heering**

Université libre de Bruxelles, Belgium

Infants have long been considered as passive recipients mostly because they lack language and show a limited behavioral repertoire. The development of sophisticated and non-invasive electrophysiological (EEG) paradigms have however demonstrated that this was not true: human infants are, from very early on, equipped with elaborated cognitive abilities that can be tracked developmentally from very young ages. Among these electrophysiological paradigms are those relying on the steady-state visual evoked potentials (SS-EP) technique. The asset of this tool is to be capable of inducing a synchronization of the brain exactly at the frequency at which the observer is experiencing the stimuli, and to have this brain activity directly recordable at the surface of human scalp. Remarkably, this tool happens to be particularly adapted to test human infants. During this talk I will list the many advantages of the SS-EP tool when it is applied to infant populations, with the ultimate goal of highlighting how neural entrainment can help revealing neurocognitive development. More specifically, I will focus on a series of recent SS-EP experiments having been conducted on infants below the age of 1, which all convincingly demonstrate the extraordinary capacities of the infant brain. When vision is concerned, for example, it appears that the infant brain is already capable of creating a category from visual items that are very different from each other (e.g., faces). It also efficiently distinguishes these items from other items that do not belong to this category (e.g., objects).

PLENARY SESSIONS  
REGULAR SYMPOSIA

## Neural evidence for odor-driven face pareidolia in infants exposed to rapid periodic streams of natural images

Diane Rekow<sup>1</sup>, Jean-Yves Baudouin<sup>2</sup>, Fanny Poncet<sup>1</sup>, Fabrice Damon<sup>1</sup>, Karine Durand<sup>1</sup>, Benoist Schaal<sup>1</sup>, Bruno Rossion<sup>3,4</sup>, Arnaud Leleu<sup>1</sup>

<sup>1</sup>Developmental Ethology and Cognitive Psychology Lab, Centre des Sciences du Goût et de l'Alimentation, Université Bourgogne Franche-Comté, France; <sup>2</sup>Laboratoire "Développement, Individu, Processus, Handicap, Éducation" (DIPHE), Département Psychologie du Développement, de l'Éducation et des Vulnérabilités (PsyDEV), Institut de psychologie, Université de Lyon, France;

<sup>3</sup>Université de Lorraine, CNRS, CRAN - UMR 7039, Nancy, France; <sup>4</sup>Université de Lorraine, CHRU-Nancy, Service de Neurologie, Nancy, France

From the very first moments of life, human infants have to navigate a complex multisensory world. However, how the young infant brain starts to categorize this flurry of ambiguous sensory inputs remains unclear. Here we test the hypothesis that visual categorization is tuned by other senses than vision, by exposing twenty 4-month-old infants either to a baseline odor or to their mother's body odor while their electroencephalogram (EEG) is recorded. Various natural images of objects are presented at a 6-Hz rate (6 images/second), interleaved by objects of the same categories but configured as faces (i.e., eliciting face pareidolia in adults) every 6th stimulus (i.e., 1 Hz). Results reveal a weak neural categorization response to facelike stimuli at 1 Hz in the EEG frequency spectrum over bilateral occipito-temporal regions in the baseline odor context. Critically, in the presence of maternal body odor, this facelike-selective response largely increases and becomes right-lateralized. Furthermore, at the individual level, this olfactory influence is particularly effective when there is no trace of face pareidolia in the baseline odor context. This indicates that non-visual (olfactory) cues associated with human faces in the infant's experience are able to shape the interpretation of facelike configurations as faces in the right hemisphere, dominant for face categorization. This provides evidence for the early tuning of face(like)-selective activity from multisensory inputs in the developing brain, suggesting that perceptual development integrates information across the senses for efficient category acquisition.



## Altercentric modulation of neural object processing in adults and infants

**Anna-Lena Tebbe<sup>1</sup>, Katrin Rothmaler<sup>1</sup>, Moritz Köster<sup>2</sup>, Charlotte Grosse Wiesmann<sup>1</sup>**

<sup>1</sup>Max Planck Institute for Human Cognitive and Brain Sciences, Leipzig, Germany; <sup>2</sup>Freie Universität Berlin, Germany

From the second year of life, infants seem to track what others see. Recent research indicates that others' perspective also seems to affect one's own representation of the environment, referred to as altercentric modulation. This raises the question how others' visual perspective affects infants' neural object processing. To address this issue, we make use of steady-state visually evoked potentials (ssVEP). SSVEPs are EEG signals induced by rhythmic visual on-off stimulation ("flickering"), resulting in brain oscillations at the same frequency. In our experiment, we use the ssVEP as a neural marker of object processing and test whether adults' and infants' oscillatory brain responses, evoked by flickering objects, are altercentrically modulated by what others can see. Participants were presented with an agent observing a flickering object disappearing either into a tunnel (no visual access neither for agent nor participant) or behind an occluder (visual access only for the agent). We hypothesize that adults and infants (aged 12-14 months) also show entrained oscillations in reaction to someone else seeing the object, even when they no longer see it themselves. As predicted, adults (N=40) show a higher ssVEP amplitude when the agent continues to see the object (occluder condition) compared to when the agent can no longer see it (tunnel condition). This indicates that neural object processing is indeed modulated by others' visual perspective in an altercentric way. We will present the results with regard to similar effects in infants (data assessment ongoing) and discuss ssVEPs as a measure for studying object representations.

## Culture-specific visual processing in the infant brain

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**Moritz Köster<sup>1</sup>, Anna Bánki<sup>2</sup>, Daiki Yamasaki<sup>3</sup>, Shoji Itakura<sup>3,4</sup>, Stefanie Höhl<sup>2</sup>**

<sup>1</sup>Freie Universität Berlin, Germany; <sup>2</sup>University of Vienna, Faculty of Psychology, Austria; <sup>3</sup>Kyoto University, Department of Psychology, Japan; <sup>4</sup>Doshisha University, Center for Baby Science, Kizugawa, Japan

Human perception is profoundly shaped by culture. Yet, the ontogenetic origins of cultural impacts on human cognition, and the underlying developmental mechanisms, remain unknown. Here we show culture-specific visual perception styles in the brains of 11-month-olds, and that cultural differences may be grounded in fundamentally different social experiences that human infants make in the early social interaction with their caregivers. Specifically, we tracked the neural signatures of object and background in the electroencephalogram (EEG) using frequency tagging (i.e., visually flickering object and background at different driving frequencies) and reveal that infants from Vienna (a western culture) show a pronounced object signal, in contrast to infants from Kyoto (an eastern culture) showing an accentuated background signal. That culture-specific perceptual processes emerge this early may be explained by distinct social interaction experiences infants' make between cultures. Mothers from Vienna pointed out object elements of a scene to their infants much more often than mothers from Kyoto, with direct consequences for infant neural processing of object versus background elements. This study shows that human visual cortical processes shaped by cultural learning from early infancy on and identifies early social interaction as a critical shaping mechanism.

# PAPER SESSION 1

## Perspective-taking and joint action

Monday, January 10, 15:30 - 16:30 UTC

**Chair:** Dora Kampis, University of Copenhagen

<https://bcccd.slack.com/archives/C02QGTEKLJF>

## Proactive or reactive? Neural oscillatory insight into the leader-follower dynamics of early infant-caregiver interaction

**Emily Phillips<sup>1</sup>, Louise Goupil<sup>1</sup>, Ira Marriott-Haresign<sup>1</sup>, Megan Whitehorn<sup>1</sup>, Lynne Murray<sup>2</sup>, Victoria Leong<sup>3,4</sup>, Sam Wass**

<sup>1</sup>University of East London, London, UK; <sup>2</sup>University of Reading, Reading, UK; <sup>3</sup>University of Cambridge, Cambridge, UK; <sup>4</sup>Nanyang Technological University, Singapore

Infants' ability to engage in joint action is fundamental to the development of language and social cognition (Donnellan et al., 2020). Studies using structured, experimental paradigms suggest that, already during late infancy, infants actively and intentionally initiate joint attention with an adult partner (Begus & Southgate, 2018). By contrast, recent micro-behavioural analysis of free-flowing infant-caregiver interaction has shown that infants rarely engage in active attention-sharing behaviours; infrequently using their caregiver's gaze to achieve episodes of mutual engagement (Yu & Smith, 2013). Here, recording dual EEG from N=37 12-month-old infants whilst they engaged in naturalistic play with an adult partner, we investigated whether infant attention was endogenously guided where they led their partner's attention. We also assessed infants' sensitivity to their partner's behavioural contingency. The onset of each joint-attention episode was identified to examine infants' ostensive signals and neural activity preceding and following infant- vs. adult-led attention. Results indicated that infant-led play episodes were not accompanied by increased endogenous oscillatory activity, or ostensive cues, in the time-period before the initiation. Infants did, however, appear sensitive to whether their initiations were responded to: when caregivers followed infants' attentional focus, infants showed greater theta/alpha suppression in the time after their initiation. Our results challenge the view

that infants are active and intentional communicators in early interaction, and suggest that low-level sensorimotor prediction plays a key role in creating and maintaining episodes of joint attention. Findings are discussed in relation to selective reinforcement accounts of early social cognition (Smith & Breazeal, 2007).

## The self-perspective in infant perspective tracking

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**Emanuela Yeung, Dimitrios Askitis, Velisar Manea, Victoria Southgate**

University of Copenhagen, Copenhagen, Denmark

We examined whether the development of the self-perspective influences infants' ability to track others' perspectives. Based on the altercentric hypothesis (Southgate, 2020), we predicted that infants' experience of perspective conflict would depend on the presence of a self-perspective, and self-perspective would lead to greater conflict when infants should know the real location of the object (high-conflict condition) than when they do not (low-conflict condition). Further, we reasoned that infants who do not yet have a self-perspective may be able to more accurately predict an agent's actions compared to infants who encode both their own and the other's conflicting perspective. To test this, we presented 18-month-olds ( $n = 50$ ), half of whom passed the mirror self-recognition (MSR) task, with a perspective conflict scenario and used pupil diameter as an index of conflict processing and anticipatory looking as a measure of action anticipation. Differences in pupil dilation were analyzed using  $2 \times 2$  repeated-measures ANOVAs across 3 pre-registered time windows. This revealed a significant main effect of MSR status in our third time window ( $F(1,48) = 4.59, p = .04, \eta^2 = .06$ ), with mirror recognisers showing greater pupil dilation during the anticipation phase. Functional t-tests ( $t(25)$  as a function over time) revealed greater dilation in mirror recognisers at an earlier time window, before the agent was occluded. There was no difference between high and low conflict conditions. In line with recent replication efforts (Kampis et al., 2021), infants did not reliably make belief-based action predictions.

## The Role of Jointness in Preschoolers' Altercentric Bias

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**Qianhui Ni<sup>1</sup>, Bella Fascendini<sup>1,2</sup>, Jake Shoyer<sup>1</sup>, Henrike Moll<sup>1</sup>**

<sup>1</sup>University of Southern California, Los Angeles, CA, USA; <sup>2</sup>Department of psychology, Stanford University, Stanford, CA, USA

It has been found that altercentric bias, the tendency to align one's perception and judgment with that of others, manifests within the first years of life (Reid et al., 2004; Southgate, 2020). We explored whether altercentrism is present in 3-year-olds and varies depending on the jointness of experience between child and other. An online adaptation of Sommerville et al.'s (2013) Sandbox Task was used to measure whether children's object searches are biased to where another agent last saw the object (its prior location). There were three conditions (n = 24 each; N = 72 total): one in which child and other jointly attended to the object in its prior location (Joint Attention Condition); one in which the other was present but unengaged with the child when the object was placed in its prior location (Other Present Condition); and a baseline condition in which only the child was present (No Other Condition). Preliminary data with n = 36 show more biased searches in the Joint Attention than the No Other Condition, indicating altercentrism. No bias toward outdated locations was found in the No Other Condition, suggesting accurate searches under non-social conditions. Results from the Other Present Condition are outstanding; its comparison with the Joint Attention Condition will reveal if altercentrism is increased by joint attention. This study helps to answer vital questions about ego- versus altercentrism in early childhood and contributes to a lively debate about the origins of perspective-taking.

## PAPER SESSION 2

### Early conceptual capacities

Monday, January 10, 17:00 - 18:00 UTC

**Chair:** Johannes Mahr, Harvard University

<https://bcccd.slack.com/archives/C02QGS2L9Y>

### The greater the better: discrimination of ordinal relationships at birth

**Martina Arioli<sup>1</sup>, Valentina Silvestri<sup>1</sup>, Hermann Bulf<sup>1</sup>, Lorenzo Colombo<sup>2</sup>, Odoardo Piccolini<sup>3</sup>,**

**Matteo Porro<sup>3</sup>, Viola Macchi Cassia<sup>1</sup>**

<sup>1</sup>University of Milan-Bicocca; <sup>2</sup>Neonatology and Neonatal Intensive Care, Fondazione IRCCS Cà Granda Ospedale Maggiore Policlinico of Milan; <sup>3</sup>Pediatric Physical Medicine and Rehabilitation, IRCCS Ca' Granda Foundation, Ospedale Maggiore Policlinico, Milan

Ordinal knowledge in preverbal infants has received little attention. Recent studies showed that, at 4 months, infants detect ordinal relationships within size-based or number-based sequences, only when magnitude changes follow an increasing order. A similar asymmetry signature in ordinal processing has been reported in monkeys. The processing advantage for increasing order might have been selected during evolution because it is relevant for survival as a result of the alerting effect associated to perceptual looming. To investigate the ontogenetic origins of ordinal knowledge, we investigated whether signatures of asymmetrical processing of ordinal magnitude changes are apparent in 2-day-old infants by testing their ability to discriminate a reversal in ordinal direction following habituation to ascending or descending sequences composed of numerical displays. Newborns in Study 1 (N=40) were habituated to ascending or descending numerical sequences providing numerical and non-numerical cues to ordinality (i.e., item size and density covaried with number), while newborns in Study 2 (N=18) were habituated to ascending numerical sequences providing purely numerical cues to ordinality (i.e., numerosity inversely related to item size and density). During test trials, newborns were shown a new set of numerosity presented alternately in both ascending and descending orders. Preliminary results show that newborns look longer to the new order only after habituation to ascending numeros-

ity, and when multiple converging cues to ordinality are provided. Together with evidence from older infants and non-human animals, these findings support the view of a continuity at both ontogenetic and phylogenetic levels of the underlying magnitude representation.



## Infants represent an abstract “add one” operation

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**Chen Cheng, Melissa Kibbe**

Boston University, USA

Infants can track the quantity of objects that are hidden sequentially, performing a “1+1=2” operation over objects (Wynn, 1992). We asked whether 15-month-old infants ( $n=22$ ) could represent an abstract “add one” operation that could be applied to any object. Infants first viewed two Baseline in which an occluder was lifted to reveal one or two objects. Next, on each of four Familiarization trials, an occluder was placed on an empty stage, and an experimenter slid an inverted cup across the stage until it rested behind the occluder. She then removed the cup, and then removed the occluder to reveal one object. Infants viewed different objects on each familiarization trial to highlight that the cup added “one object,” and not any specific object. At Test (4 trials), infants viewed a single (new) object on the stage, which was then occluded, and then the cup was moved behind the occluder and out of the scene. The occluder was then removed to reveal one object (familiar but unexpected outcome) or two objects (unfamiliar but expected outcome) and infants’ looking times were measured. We observed an interaction between mean looking times (log transformed) to Baseline and Test trials as a function of the number of objects revealed ( $p = .01$ ,  $\eta^2p = .276$ ): while infants looked longer to two objects at Baseline, infants’ pattern of looking reversed at Test, suggesting infants learned that the cup “added one” and updated the quantity behind the occluder accordingly, without directly observing the addition of the second object.

## Infants' reasoning about impossible alternatives vs. possibilities eliminated via negation

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Rachel Dudley, Ágnes Melinda Kovács, Ernő Téglás

Cognitive Development Center, Central European University, Budapest, Hungary

Reasoning involves considering possibilities and using evidence to eliminate non-actual ones. We ask whether 12-month-olds can distinguish between an impossible outcome and one that was once possible but it has been eliminated from consideration via non-verbal negation. If negation is not involved in elimination, and such outcomes are treated similar to impossible outcomes, we should find no discrimination. Using a looking time paradigm, infants watch a series of hiding events: although there are four boxes (A-D), a ball could only be hidden in a subset during the critical scenario (BVCVD). Infants were then shown that one of the boxes is empty ( $\neg B$ ), allowing us to contrast infants' responses to finding that the ball in one of the possible (C/D), eliminated (B) or impossible (A) locations. If negated possibilities are distinguished from impossible ones, then we expect to find a difference between their looking to eliminated (B) vs. impossible (A) outcomes. Experiment 1 verified that infants look longer when the ball is revealed in an impossible location (A;  $M=11.5s$ ,  $SD=5.9s$ ) compared to a possible location (C/D;  $M=7.5s$ ,  $SD=3.6s$ ), affirming that they are surprised when the impossible proves actual ( $t(18)=-2.88$ ,  $p<.05$ ). Experiment 2 (in progress) asks whether infants distinguish the impossible (A) from the eliminated (B) outcome. If infants represent the different possibilities and then eliminate one (BVCVD;  $\neg B$ ), we expect that they should be more surprised by seeing the ball in this eliminated location (B) than in one which they are not actively suppressing (A).

# PAPER SESSION 3

## Action understanding

Tuesday, January 11, 17:00 - 18:00 UTC

**Chair:** Denis Tatone, Central European University

<https://bcccd.slack.com/archives/C02QGSHUASW>

## Open-minded, not naïve: Three-month-old infants can learn that objects and locations are the goals of other people's reaches

**Brandon Woo<sup>1,2</sup>, Shari Liu<sup>2,3</sup>, Elizabeth Spelke<sup>1,2</sup>**

<sup>1</sup>Department of Psychology, Harvard University, Cambridge, MA, USA; <sup>2</sup>The Center for Brains, Minds, and Machines, Cambridge, MA, USA; <sup>3</sup>Department of Brain and Cognitive Sciences, Massachusetts Institute of Technology, Cambridge, MA, USA

People sometimes act on objects because of what they are (e.g., using forks, not knives, to eat spaghetti), where they are (e.g., clearing the table, regardless of what's on it), or both (e.g., eating with the fork next to your plate, not your dining partner's). As adults, we readily infer others' goals from their actions. If someone reaches for a teddy bear over a ball, for instance, we infer that they likely desired the bear, rather than the location that the bear was at. Classic work in developmental psychology has found that 3-month-old infants appear to lack expectations that agents will continue acting on the same objects that they had previously reached for. Do 3-month-old infants fail to view reaching as goal-directed, or are they uncertain which properties of objects (what versus where an object is) are relevant in different contexts? Here, we show that 3-month-old infants can attribute either object goals or location goals to an agent, when provided with strong evidence that the agent acts on the same object regardless of where it is (Exp. 2), or the same location regardless of what object is there (Exp. 3). By contrast, when 3-month-old infants received ambiguous evidence about why an agent acted on an object, infants did not expect the agent to continue acting on the same object nor the same location (Exp. 1). Our findings suggest that before infants reach for objects themselves, infants can adaptively learn about others' goals based on what evidence they receive.

## Are infants sensitive to intention information encoded in grasping movement kinematics?

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Joanna Rutkowska<sup>1</sup>, Marlene Meyer<sup>1,2</sup>, Andrea Cavallo<sup>3</sup>, Cristina Becchio<sup>3</sup>, Sabine Hunnius<sup>1</sup>

<sup>1</sup>Donders Institute, Radboud University, Nijmegen, Netherlands; <sup>2</sup>Department of Psychology, University of Chicago, Chicago, US; <sup>3</sup>C'MoN, Cognition, Motion and Neuroscience Unit, Fondazione Istituto Italiano di Tecnologia, Genova, Italy

Predicting others' actions is crucial in social interactions (Sebanz & Knoblich, 2009). Movement kinematics have been proposed as an important cue to recognise others' intentions and predict the next action (Becchio et al., 2018). For instance, the way one grasps a bottle differs based on whether one wants to drink or pour from it, and adult observers are able to predict the next action from the grasp alone (Cavallo et al., 2018). How this ability develops in young children is still unknown. This pre-registered study investigates this ability's first prerequisite, namely the discrimination of intention-related movement kinematics in infants. Fourteen-month-old infants were tested in a habituation paradigm. During the habituation phase, they were shown videos of grasping actions with one of two intentions: grasp-to-drink or grasp-to-pour. If the infants habituated, they were moved to the test phase, where they were shown two videos of grasps carried out with either the same or different intention than before (between-subjects). We hypothesise that infants presented with a different intention grasp than in the habituation phase will show a different (increased or decreased) looking time during the test phase than the infants presented with grasps with the same intention. This would demonstrate that infants are sensitive to the intention information encoded in grasping movement kinematics. The data collection is still in progress, currently  $n = 39$ . The final sample will be determined using Sequential Bayes Factor design (Mani et al., 2021). We expect to present the final results at the conference.

## Preschool children's predictions of others' actions: Previous paths or the previous goals?

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Markus Paulus<sup>1\*</sup>, Gökhan Gönül<sup>1,2\*</sup>, Marina Kammermeier<sup>1</sup>

\*These authors contributed equally to this work.; <sup>1</sup>Department of Psychology, Ludwig-Maximilians-Universität München; <sup>2</sup>Cognitive Science Centre, University of Neuchâtel

Young children's capacity to understand events and goals has been one of the core topics in the development of social cognition literature. There have been some ongoing debates on whether infants and young children prioritize goals over means while they interpret others' actions. Although some influential theories predominantly have underscored the role of goals over means in action understanding in infants, some recent studies demonstrate the opposite. The current study aimed to further advance this debate via investigating action predictions of preschool children when they interpret others actions. To this end, in two experiments (n = 172), we assessed children's and adults action predictions of other agents' actions based on the question of whether children would predict an agent to follow a previous goal (namely, goal-related predictions) or predict the agent to follow the previous path. In Experiment 1, 2.5-to-6-year-old preschool children and adults (for comparison) were presented with animated agents, and in Experiment 2, 3-to-6-year-old were presented with a human grasping action. Both experiments indicated that preschool children expect agents to follow a previously pursued trajectory, rather than a previously selected goal, even though this action would lead to a new goal. These findings are in line with the view that preschool children's action predictions mostly rely on the detection of statistical regularities of movement patterns. We discussed our results in the light of theoretical frameworks putting more emphasis on action understanding as a unitary term rather than making a strict dichotomy between action and goal.

## PAPER SESSION 4

### Words and labels

Wednesday, January, 15:00 - 16:00 UTC

**Chair:** Gabor Brody, Brown University

<https://bcccd.slack.com/archives/C02QA6A7APQ>

### Labelling occluded objects: Infants' semantic mismatch detection is modulated by another person's perspective

**Dora Kampis, Dimitris Askitis, Victoria Southgate**

University of Copenhagen, Copenhagen, Denmark

The N400 is an ERP component sensitive to semantic violations (Kutas & Hillyard, 1980). Forgács et al (2019) found an n400 effect in 14-month-old infants also when a label was incongruent for another person only, but no reduced n400 effect was found if the label was incongruent for the infant, but congruent for the other (Forgács et al, 2020). This was interpreted as the N400 reflecting incongruity with any representation of the referent, rather than a mismatch with the observer's belief. However, the objects were visible to infants but not to the agent at the time of labelling, thus their perspectives were not in competition. Southgate (2020) suggested that infants encode socially cued targets stronger than their own perspective, predicting a reduced n400 when infants' and another person's perspective are in competition and labelling is congruent for the other. In a series of studies we hid the object in a box at the time of labelling, so its representation had to be maintained. First, we established that 14-month-olds detect when an occluded object is labelled incorrectly ( $t(27)=2.298, p=0.03$ ). Then we created a perspective mismatch, and labelling was always incongruent for the infant, but in 50% congruent for the other. We found a reduced n400 for the congruent-for-other trials ( $t(33)=-2.19, p=.036$ ), indicating an altercentric influence on infants' semantic mismatch detection, and preliminary analyses show this correlated with infants' salivary oxytocin levels ( $r(16)=-.528, p=.036$ ). A follow-up probes whether infants detect incongruency from their perspective when the labelling is always consistent for the other.

## Children know what words other children know

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Ashley Leung<sup>1</sup>, Benjamin Morris<sup>1</sup>, Daniel Yurovsky<sup>2</sup>

<sup>1</sup>University of Chicago, USA; <sup>2</sup>Carnegie Mellon University, USA

To communicate successfully, we need to use words that our conversational partner understands. Adults maintain precise models of the words people are likely to know, using both their experience with their conversational partner and general metalinguistic information. These models allow adults to estimate others' vocabulary knowledge, and calibrate their speech appropriately. Do children also know what words others are likely to know? Prior work shows that children are able to infer others' general knowledge states, but few studies have probed children's ability to estimate other people's specific lexical knowledge. In a pre-registered study, we asked children ages 4-8 (n = 62) to predict whether a very young child would know each of 15 familiar animal words. With minimal information, even children as young as 4 made reliable predictions about the target child's lexical knowledge, and their judgments became more robust over development. That is, children were more likely to judge that a younger child knew an early-acquired word (e.g., dog) than a late-acquired word (e.g., lobster). Children's open-ended explanations of their reasoning primarily involved language-based cues (e.g., word length). Ongoing work explores how children spontaneously infer and use listener knowledge in a communicative, reference-game setting. While prior literature has shown inconsistent evidence regarding children's ability to engage in listener-designed speech, this line of work seeks to better understand what cognitive skills underlie children's successes and struggles in communicating with others.

## Do pragmatic inferences aid word learning in young children and adults?

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Natalie Bleijlevens<sup>1,2</sup>, Tanya Behne<sup>1,2</sup>

<sup>1</sup>Developmental Psychology, University of Göttingen, Germany; <sup>2</sup>Leibniz ScienceCampus 'Primate Cognition', Göttingen, Germany

How do children succeed in learning a word? Do young children, as well as adults, rely on pragmatic information to resolve referential ambiguity and identify the referents of unknown labels? Developmental research has shown robustly that if young children hear a novel label and are confronted with several potential referents, they assume the novel label refers to the novel name-unknown object rather than to any familiar name-known object. While this disambiguation effect is well documented, ongoing debates center on the underlying mechanism. Is this based on lexical constraints (e.g., the mutual exclusivity bias), guided by pragmatic reasoning, or simply driven by children's attraction to novelty? Additionally, recent research has questioned the role of referent disambiguation for children's word learning, suggesting that children's in-the-moment resolution of referential ambiguity is to some extent distinguishable from their long-term learning. To explore these issues, we conducted a pre-registered online study with 2- and 3-year-olds and adults. Participants were presented with novel unnamed objects as potential referents for a novel word. Across conditions, we manipulated whether participants were provided with pragmatic information that indicated which object the speaker might refer to, or whether the only the difference between the two unnamed objects was their relative novelty to the participant. The pattern of results across several measures demonstrates the role of pragmatic information for referent disambiguation and word learning in both adults and young children. These findings highlight that, from early ontogeny on, children's social cognitive understanding guides their communicative interactions and supports their language acquisition.



# PAPER SESSION 5

## Cooperation

Wednesday, January 12, 16:30 - 17:30 UTC

**Chair:** Elizaveta Vorobyova, Central European University

<https://bcccd.slack.com/archives/C02QGTHNTM1>

## Team membership, not friendship, facilitates preschoolers' cooperation and competition among familiar peers

**Susanne Reisner<sup>1,2</sup>, Gabriela Markova<sup>1</sup>, Thomas Bugnyar<sup>2</sup>, Lisa Horn<sup>2</sup>**

<sup>1</sup>Department of Developmental and Educational Psychology, University of Vienna, Austria; <sup>2</sup>Department of Behavioural and Cognitive Biology, University of Vienna, Austria

Cooperation and competition are cornerstones of human social behaviour that undergo substantial development during preschool age. However, we do not know whether and how social dynamics in naturalistic peer groups influence children's cooperative and competitive behaviours. The goal of this study was to investigate 3–6-year-old preschoolers' ability to strategically cooperate with and compete against familiar peers depending on team membership and the potential effect that friendships have on their choices. Children played a strategic ring collecting game in two teams of two against each other. In ten rounds, each child could decide to take rings from a neutral location or from another player (neutral vs. competitive taking) and to keep the rings or give them to another player (neutral vs. cooperative giving). Each child played the game twice with the same group of four but with changed team membership. Additionally, we assessed friendship between the peers and paired children once with a friend and once with a non-friend. Preliminary analyses ( $n = 28$ ) revealed that children cooperated significantly more with team members and competed significantly more against opponents. There was no significant effect of friendship on cooperation or competition, indicating that team membership was more important than friendship. However, girls tended to be less competitive towards friends, which could be explained by gender-typical friendship structures. Results of this study suggest that preschoolers make strategic cooperative and competitive choices based on artificial group dynamics (team membership) rather than natural group dynamics (friendship).

## How young children balance the needs of others and personal cost while helping

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Ece Yucer, Hannah Solby, Elisabetta F. Canaletti, Katie S. Rose, Jessica A. Sommerville

University of Toronto, Toronto, Canada

Previous research has shown that young children are eager to share resources (Hay & Cook, 2007) and help others (Warneken & Tomasello, 2006). Sommerville et al. (2018) found that prosocial behavior in children decreases as personal costs are increased. However, the underlying mechanisms motivating early prosocial behavior are unclear; specifically, it is not known if or how young children weigh others' needs against the personal costs incurred by helping. Here, we are investigating how 5-year-olds ( $n = 96$ ) evaluate cost and need while helping, using a 2 (high versus low need) by 2 (high versus low cost) design. Children are trained on a novel game wherein they move desired objects into a character's bin by clapping. Before each trial, the cost level (difficulty) and the character's need level are presented; children choose to play or skip each trial. We observe whether children choose to play and record the number of claps per trial. Preliminary results demonstrate that children ( $n = 47$ ) chose to play, numerically but not significantly, more low cost ( $M=6.59$ ,  $SD=2.36$ ) than high cost ( $M=5.85$ ,  $SD=2.68$ ) trials,  $t(46) = 1.45$ ,  $p = 0.15$ , and helped in more high need ( $M=6.79$ ,  $SD=2.28$ ) over low need ( $M=5.66$ ,  $SD=2.04$ ) trials,  $t(46) = 3.23$ ,  $p < .001$ . We are also investigating individual differences in helping behavior through measures of empathy and inhibitory control. Overall, this study will help identify whether early helping behaviours are truly prosocially motivated.

## Social evaluation in 4 - 7 year-old children: Age-related changes in partner choice in cooperative versus competitive settings

Rowan Titchener<sup>1,2,3</sup>, Jonas Hermes, Julia Fischer<sup>1,2,3</sup>, Hannes Rakoczy<sup>2</sup>, Stefanie Keupp<sup>1,2,3</sup>

<sup>1</sup>Cognitive Ethology Laboratory, German Primate Center, Göttingen, Germany; <sup>2</sup>Department of Developmental Psychology, University of Göttingen, Germany; <sup>3</sup>Leibniz-ScienceCampus 'Primate Cognition', Göttingen, Germany

Children become competent social decision makers from around four years of age, with studies on selective trust, selective social learning and helping showing that children can make informed choices who to copy or ask for help in cooperative experimental settings. Less is known about the developmental trajectory of social decision making in competitive contexts. However, the ability to evaluate opponents (for example regarding status, physical strength, or more specific abilities) is just as important, because children are frequently confronted with competitive situations and have to learn to navigate these successfully. The present experiment contrasted partner recruitment in cooperation and competition contexts. We tested 123 children (aged 4 – 7 years) in an online study, to establish whether age and context interact to affect rational partner choice. We introduced two animated characters that differed in physical strength. Test trials consisted of three competitive and three cooperative strength tasks; in each task, children selected either a team-mate (rational choice = strong character) or opponent (rational choice = weak character). We found that rational partner recruitment was mediated by context and age. Children made more rational choices in the cooperative as opposed to the competitive context and rational choices increased with age. In addition, the majority of the children generalised the characters' competencies to the knowledge domain and did so in both contexts; weak evidence ( $p = 0.075$ ) suggests this behaviour could be mediated by age, with older children more prone to generalising.

## PAPER SESSION 6

### Decision-making

Thursday, Jan 13, 17:00 - 18:00 UTC

**Chair:** Georgina Török, Max Planck Institute for Human Development

<https://bcccd.slack.com/archives/C02QA6BU6QN>

### The biological origins of risk preference

**Lou M. Haux<sup>1</sup>, Jan M. Engelmann<sup>2</sup>, Ruben Arslan<sup>1</sup>, Ralph Hertwig<sup>1</sup>, Esther Herrmann<sup>3</sup>**

<sup>1</sup>Center for Adaptive Rationality, Max Planck Institute for Human Development, Berlin, Germany; <sup>2</sup>Department of Psychology, University of California, Berkeley, CA, United States; <sup>3</sup>Centre for Comparative and Evolutionary Psychology, Department of Psychology, University of Portsmouth, United Kingdom

Risk and uncertainty are central to all adaptive decisions human and nonhuman animals make — including when deciding where to forage, with whom to mate and how to deal with dangerous situations. Risk preference determines how agents decide in face of these hazards and is a crucial determinant of life outcomes such as health, wealth, and wellbeing. Yet, the biological underpinnings of this important building block of behavior remain unclear. Here, we investigated the extent to which chimpanzees' (Pan troglodytes) exhibit risk preferences that are in important respects isomorphic to human risk preferences. Chimpanzees are an ideal reference: they are one of humans' two closest living relatives, live in large, mixed sex social groups and have similar developmental stages with a long infant dependency, a period of adolescence and a long life expectancy of up to 50 years. Using a multimethod approach we studied chimpanzee (N=86) risk preference across domains and measurements. Our results show that chimpanzees' willingness to take risks shares structural similarities with that of humans across four key dimensions: chimpanzee risk preference manifests as a trait-like preference that is consistent across domains and measurements, chimpanzees are ambiguity averse, males more risk prone than females and that the appetite for risk taking follows an inverted U-shaped relation to age. Our findings suggest that key dimensions of risk preference emerge independently of the influence of human cultural evolution and thus may have deeper phylogenetic roots than previously suspected.

## The Developmental Trajectory of Learning and Exploration

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**Anna Giron<sup>1</sup>, Simon Ciranka<sup>2,3</sup>, Eric Schulz<sup>4</sup>, Wouter van den Bos<sup>5</sup>, Azzurra Ruggeri<sup>2,6</sup>, Björn Meder<sup>2,7</sup>, Charley M. Wu<sup>1,2</sup>**

<sup>1</sup>University of Tübingen, Tübingen, Germany; <sup>2</sup>Max Planck Institute for Human Development, Berlin, Germany; <sup>3</sup>Max Planck UCL Centre for Computational Psychiatry and Ageing Research, Berlin, Germany; <sup>4</sup>Max Planck Institute for Biological Cybernetics, Tübingen, Germany; <sup>5</sup>University of Amsterdam, Amsterdam, The Netherlands; <sup>6</sup>Technical University Munich, Munich, Germany; <sup>7</sup>Health and Medical University Potsdam, Potsdam, Germany

Learning from past experiences helps orient the exploration of unknown environments. Yet how we learn and explore changes over the lifespan, corresponding to different stages of cognitive development and different lifespan-rational goals. In this work, we analyze data from  $n=281$  participants between the ages of 5 and 55, to model age-related changes in exploration and generalization. We use a spatially-correlated multi-armed bandit task (Wu et al., 2018) that allows us to simultaneously model the separate and recoverable contributions of reward generalization (i.e., predicting novel outcomes), and both uncertainty-directed and random exploration. Through a combination of behavioral and model-based analyses, we show that exploration becomes more efficient over age, with increases in generalization, while both directed and random exploration decrease sharply in childhood. Counterfactual simulations also reveal that participants' parameters move towards and reach the optimal frontier of learning strategies in adulthood. Furthermore, we compare the age-related trajectory of human parameter estimates to a stochastic optimization algorithm, as a rational comparison to how the parameters of our model (generalization, directed exploration, and random exploration) should optimally develop over time. These results reveal that people generalize less and exhibit less uncertainty-directed exploration compared to the optimal trajectory. Since both generalization and directed exploration are computationally costly, people may develop in a resource-rational manner, trading off performance against computational costs. Our work provides important insights into the developmental trajectory of human learning, providing a concrete empirical comparison to commonly used analogies of stochastic optimization in developmental psychology.

## **“Plan chunking” improves 3-year-olds’ ability to use episodic memories to guide future actions**

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**Tashauna Blankenship<sup>1</sup>, Melissa Kibbe<sup>2</sup>**

<sup>1</sup>University of Massachusetts Boston, Boston, MA; <sup>2</sup>Boston University, Boston, MA

Planning often involves applying past experiences to accomplish novel goals. Our past research suggests that 3-year-olds can draw on episodic memories to execute complex, multistep plans (Blankenship & Kibbe, 2019), but this ability is limited by the number of steps required to execute the plan, and 3-year-olds struggle with plans that require more than two steps. In the current study, we asked whether 3-year-olds could “chunk” the necessary steps in a plan to accomplish more complex goals. Thirty-two 3-year-olds (M=42.12 months; 18 girls) were asked to complete a series of cartoon “treasure maps” (depicted by red or blue outlined squares presented in a row). They then learned that two buttons on a “rainbow box” each produced a specific color map piece (red or blue). During test, children were asked to complete the maps, drawing on their experience with the box to point to the buttons that would produce the requested colored pieces in the correct order. The outlined squares on the treasure maps were presented in alternating order (e.g., Red, Blue, Red, Blue) or were grouped in a way that could facilitate chunking (e.g., Red, Red, Blue, Blue). Children accurately completed more of the maps on chunking compared to alternating trials ( $p=0.037$ ). Age was associated with chunking ( $p=.007$ ), but not alternating ( $p=.207$ ) performance. Together, these results suggest that “plan chunking” may support children’s ability to execute multi-step plans, and that the ability to use this strategy increases across the 4th year of life.

# PAPER SESSION 7

## Pragmatics

Friday, January 14, 15:30 - 16:30 UTC

**Chair:** Rachel Dudley, Central European University

<https://bcccd.slack.com/archives/C02QGTKCE9Z>

## Reduction of context extension helps children compute implicature

**Maumita Bhaumik**

The English and Foreign Languages University, Hyderabad, India

Children often struggle to comprehend that an under-informative utterance such as ‘Mary had a dog or a lamb’ implies the negation of a stronger assumption, ‘Mary had a dog and a lamb’. The reason for such difficulty to derive implicature is yet a matter of debate. The present study thus examines preschoolers’ ability to derive scalar implicature and suggests that children’s pragmatic difficulty lies in extending the context in search of relevant assumptions for implicature derivation. The study, therefore, predicts that a reduction in context extension should help children compute the implicature. In a binary judgement task, Bengali-speaking 4- to 5-year-olds, 8- to 10-year-olds, and adults were required to comprehend sentences involving disjunction (e.g. I will bring you a bicycle or a car). The relevant assumptions for computing implicature were provided in the participants’ initial context, and thus the context extension was reduced. The results suggest that 4-year-olds could successfully compute the implicature with their responses being reliably above chance ( $< 0.00001$ ), and their performance was no different from the older children, though lower than the adult controls. The findings clearly suggest that children can compute implicature when their context extensions are reduced, which implies that their core deductive process is well-functioning. The theoretical underpinnings of the findings are discussed with reference to the Relevance theory.

## The development of conditional meaning

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**Myrto Grigoroglou, Patricia Ganea**

University of Toronto

Conditionals have multiple meanings: the statement “If Jill goes out without an umbrella, she will get wet” is true when Jill goes out without an umbrella and gets wet (conjunction), when she goes out with an umbrella and does not get wet (biconditional) and when she goes out with an umbrella and (still) gets wet (conditional). Developmental research shows difficulties in understanding conditionals (often persisting into adulthood), but the nature of this difficulty remains unclear. Some argue that children have problems representing multiple possibilities, due to limited cognitive resources (Markovits & Barrouillet, 2002). Others suggest that children have difficulties deriving some interpretations due to task-related factors (Rumain et al., 1983). Here, we use a new, less complex paradigm that allows us to examine children’s conditional interpretations at a much younger age. Eighty 3-6-year-olds and twenty adults were asked to match an if-then statement with one of two pictures: one depicting a scenario where the conditional is false vs. one of the three scenarios where the conditional is true. Unlike prior research, adults were successful with all three interpretations. Children had a conjunctive interpretation since age 3 but the development of the other two interpretations was particularly protracted. Interestingly, children were more successful in the conditional than the biconditional interpretation, perhaps due to alternative reasoning strategies in the forced-choice task. Preliminary results from follow-up experiments suggest that the other two interpretations are acquired by age 10, earlier than previously thought. Our findings suggest that children’s difficulties with conditionals are task-dependent.



## Do children make pedagogical interpretations of counterfactual questions?

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Jonathan F. Kominsky<sup>1,2</sup>, Patrick Shafto<sup>2</sup>, Elizabeth Bonawitz<sup>1,2</sup>

<sup>1</sup>Harvard University Graduate School of Education; <sup>2</sup>Rutgers University – Newark

Past work has found that children ages 5-10 sometimes struggle to answer the question “what would have happened” in overdetermined cases, in which there are multiple independently sufficient causes. Specifically, children make an error where they say the outcome would be different if only one of the causes were changed (Rafetseder, Schwitalla, & Perner, 2013). We sought to understand why children make this error. One possibility is that children are picking up on pedagogical cues: The experimenter presents the story, and then asks the children what would have happened if one of the two causes had been absent. Young children may believe the experimenter is highlighting the causal relevance of that cause by using a “pedagogical question” (e.g., Yu, Shafto, & Bonawitz, 2018), because the experimenter knows everything that happened. If the experimenter asking the question did not know the outcome was overdetermined, children might interpret the question as information-seeking rather than pedagogical and show increased accuracy (Bonawitz et al., 2020). To test this hypothesis, we presented children ages 5-8 with overdetermined narratives, but manipulated whether the experimenter asking the counterfactual question had full knowledge of the events, or only ‘saw’ one of the causes and was unaware that the outcome was overdetermined. Preliminary data from 104 5-8-year-olds (of 144 planned) suggests that children may be more accurate in answering the counterfactual question when the question-asker is ignorant ( $M=.46$ ) than when the question-asker has full information ( $M=.27$ ). Thus, social-pragmatic cues may be one factor contributing to counterfactual reasoning errors.

## PAPER SESSION 8

### Social categories

Friday, January 14, 17:00 - 18:00 UTC

**Chair:** Nazli Altinok, University of Konstanz

<https://bcccd.slack.com/archives/C02QGTLJ1U3>

### Let's talk structure: the positive consequences of structural representations

**Marianna Y. Zhang, Ellen M. Markman**

Stanford University

How should we think about differences and disparities between social groups? We often essentialize social groups, positing internal essences as the cause of group properties, which leads to problematic outcomes, e.g. assuming all group members are that way (overgeneralization or stereotyping), and judging those who do not conform with that assumption negatively (normativity). Structural representations, which consider a stable context external to the group as the cause of group properties, may be a better alternative. In 3 studies, attributing group differences to a structural cause, as opposed to a biological or a cultural cause, resulted in more positive consequences in thinking about what is the case (generalization), what should be the case (normativity), and how to change what is the case (intervention). For a difference in what groups eat, adults given a structural cause generalized in a more context-sensitive manner, judged non-conformity as more acceptable, and suggested more structural and fewer group-based interventions to change the property; 5- to 8-year-olds showed the latter two consequences as well. For a disparity in groups working low- vs high-status jobs, adults also considered the disparity less acceptable. Cultural causes generally showed an intermediate or even more extreme pattern of consequences than biological causes, suggesting that attributing group differences to groups' shared beliefs or values may be yet another form of essentialism. Rather than attributing group differences to biological or cultural essences, structural representations, which attribute group properties to an external context, could be a more constructive alternative to promote.

## The pyramidal shape of social dominance hierarchies

Olivier Mascaro<sup>1</sup>, Nicolas Goupil<sup>2</sup>, Hugo Pantecouteau<sup>1</sup>, Jean-Baptiste Van der Henst<sup>3</sup>, Nicolas Claidière<sup>4</sup>

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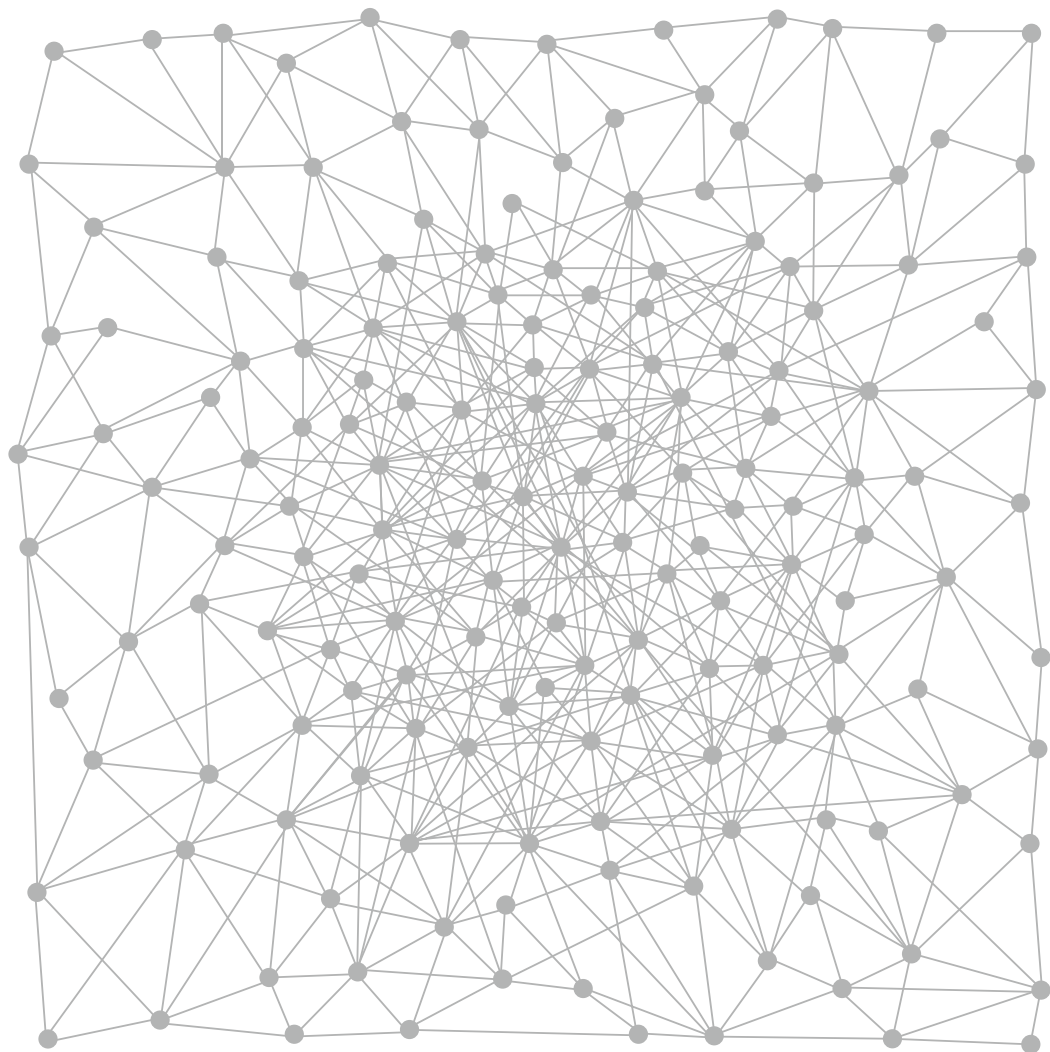
Social dominance hierarchies take only a restricted set of structural shapes across societies and cultures. We investigate the origins of these regularities, (i) by determining the structural shape of children’s hierarchies, (ii) comparing it to what is observed in non-human animals, and (iii) by assessing infants’ expectations about the shape of hierarchies. We focus on triadic motives — observed for sets of three individuals. Study 1 shows that in children’s social dominance networks (n = 277, 20 independent groups), pyramidal triadic patterns —one agent dominating two other ones— are much more frequent than tree-like triadic patterns —two agents dominating another one. Simulations indicate that this pattern can be explained by an overabundance of pyramidal motives in children’s hierarchies. A formal comparison of children and non-human animal hierarchies reveals strikingly similar patterns of triadic motives. Studies 2 and 3 investigate infants’ expectations about triadic dominance motives. We familiarize 14-month-olds with 2D animations showing that some agents dominate other ones, i.e., consistently prevail in a competitive situation. During the test, infants look significantly longer at interactions that violate, rather than confirm, pyramidal hierarchical motives. Controls confirm that these results cannot be explained by low-level features of videos. Thus, children’s actual dominance networks tend to be pyramidal (rather than tree-like). Furthermore, pre-verbal infants expect social dominance networks to be organized according to pyramidal triadic motives. These results contribute to explain why humans’ social dominance structures tend to converge towards pyramidal shapes.

## **Children are not naïve personality psychologists: 4-year-olds prioritize relational over dispositional interpretation of third-party interactions**

**Barbara Pomiechowska<sup>1</sup>, Denis Tatone<sup>1</sup>, Dorottya Mészégető<sup>1</sup>, Barbu Revencu<sup>1</sup>, Gergely Csibra<sup>1,2</sup>**

<sup>1</sup>Central European University; <sup>2</sup>Birkbeck, University of London

Observing social interactions allows inferences about dispositions of the participants (A is generous) and/or their social relations (A and B are kin). It is debated which inferential strategy is prevalent during development. While nonverbal paradigms suggest that concepts of good/bad agents are available in infancy, studies using vignettes indicate that preschoolers have difficulties making dispositional attributions and predicting behavior based on trait labels. To address this discrepancy, we investigated how preschoolers (n = 60) and adults (n = 60) interpret nonviolent conflicts between two agents in a nonverbal task. Participants first watched one agent succeeding to collect the ball that both agents sought to get. Subsequently, a screen occluded the outcome of the conflict, and the participants were asked which agent took the ball. We varied within-subjects who participated in the test conflict: the same pair of agents, a new dominant (replacing the agent who previously prevailed), or a new subordinate (replacing the agent who previously yielded). Children reliably chose the agent who previously prevailed in the same-agents condition and responded randomly in the new-partners conditions. Their choices were thus informed by relational inferences: positing a stable dominance relation within the dyad while having no expectations whether the agents would prevail or yield again facing a new partner. Conversely, adults chose the previously dominant agent in the same-agents and new-subordinate conditions, suggesting that, besides inferring stable status asymmetries within the dyad, they generalized the disposition to prevail on others. Overall, relational inferences seem to precede dispositional inferences in development.





## **A-0001 Children’s Biased Preference for Information about Real and Minimal In- and Out-Groups**

Meytal Nasie<sup>1</sup>, Ohad Ben Yaakov<sup>2</sup>, Yara Nassir<sup>2</sup>, Gil Diesendruck<sup>2</sup>

<sup>1</sup>Tel Aviv University, Tel Aviv, Israel; <sup>2</sup>Bar-Ilan University, Ramat-Gan, Israel

The tendency to evaluate members of one’s group – the in-group – more favorably than members of other groups – the out-group, is a prevalent social phenomenon that may have destructive effects on intergroup relations. Developmental work shows that such a bias is present very early in life. A crucial question, therefore, is where do these biases come from? We investigated a potential conceptual foundation for such a bias, namely, the tendency to construe out-group members as category exemplars and in-group members as individuals.

In Study 1, we investigated the scope of information (individual vs. category) that 64 Jewish-Israeli 5- and 8-year-olds wanted to receive about members from their “real-life” in-group (“Jews”), “conflictual” out-group (“Arabs”), or a “neutral” out-group (“Scots”). The findings revealed that 8-year-olds – but not 5-year-olds – requested category information more about the out-groups than the in-group. In Study 2, we asked whether this informational bias might have derived from children’s greater familiarity with the in-group compared to the out-groups, or instead reflects a general intergroup construal bias. To this end, we adopted the same procedure used in Study 1, but presented 64 Israeli Jewish and Arab 8-year-olds with novel “minimal” groups instead of real ones. Study 2 produced the same results as Study 1: again children preferred more categorical information about their minimal out-group than about their minimal in-group. These findings indicate that children’s interest in in- and out-groups is shaped by biased forms of construing such groups.

<https://bcccd.slack.com/archives/C02Q2NMER33>

**Session 10 [Thursday, January 13, 20:30 - 22:00 (UTC +0)]**

**Session 8 [Thursday, January 13, 07:00 - 08:30 (UTC +0)]**

## **A-0002 Meta-context and pragmatic processing - Cognitive developmental aspects of contextual awareness and optimal relevance**

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Zsuzsanna Schnell

Department of Cultural Theory and Applied Communication Studies, University of Pécs, Hungary

Background: Our study examines properties that describe parameters of the context of interpretation itself: meta-context. We propose a model that examines the effect of optimal relevance and thus of mental-state specific context on interpretation (Sperber-Wilson 1986).

Method: Our experimental pragmatic study investigates preschoolers' social cognitive skills, and in view of these, their ability to decipher opaque constructions like metaphor, irony and verbal vs non-verbal humor. Different contexts offer different cues for interpretation. We test our hypothesis whether context targeting mental states significantly improves interpretation of non-compositional meaning like in the case of idioms, humor or irony, whereas non mental state specific, regular linguistic and situational context aids but does not significantly affect pragmatic meaning construction. Furthermore, we examine the role of 'modality as context' in the verbal (linguistic) vs. visual (nonverbal) domain in our non-verbal humor condition. Effects of modality-given context are also investigated using Spearman's correlations, Mann-Whitney and ANOVA in SPSS.

Results, Conclusion: Mental state specific context significantly improves comprehension of pragmatic utterances to an extent that it can serve as a compensatory strategy. Effect of context was more pronounced in the inter-contextual (visual vs verbal context) comparison than in an intra-contextual (verbal: contextualized vs decontextualized) dimensions. We suggest a model of context-sensitive interpretation and claim that usability of context awareness is a tool for identifying optimal relevance (Sperber-Wilson 1986, Giora 2001) very early on. Our findings confirm results in developmental research that surface cues help in the recognition of communicative intent (Csibra 2010) and contribute to the successful resolution of the intended meaning at hand (Schnell 2019).

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**Session 7 [Wednesday, January 12, 20:30 - 22:00 (UTC +0)]**

**Session 8 [Thursday, January 13, 07:00 - 08:30 (UTC +0)]**



## **A-0003 Modeling individual differences in children's understanding of gaze cues**

Julia Prein, Manuel Bohn, Daniel Haun

Max Planck Institute for Evolutionary Anthropology, Leipzig, Germany

In order to explain and predict the behavior of agents, we use social cognition: we represent and reason about other's perspectives, knowledge, intentions, beliefs, and preferences. Much research has been devoted to studying the average age at which certain social-cognitive abilities emerge in development. However, traditional measures of social cognition (e.g., false belief change-of-location tasks) do not have satisfactory psychometric properties and are not designed to capture individual differences between children. We argue that a systematic individual differences perspective on social-cognitive development is needed.

To approach this issue, we designed an interactive web interface to study individual differences in social cognition in young children and adults. This novel task assesses the participant's ability to follow an agent's gaze, using a continuous spatial layout. Furthermore, we formalize the process of gaze following in a computational cognitive model that allows us to conceptualize and interpret individual differences in a psychologically meaningful way. The key parameter in our model is an inferential component, which describes how accurate the participant is in inferring the target's location based on the agent's gaze. In addition, the model estimates the probability that the participant uses the available gaze information or engages in random guessing. We validate our task and the model in 7 studies with adults (N = 285) and children between 3 and 5 years of age (N = 240).

Taken together, this work illustrates how method and (formal) theory development can go hand in hand to shed light on the development of social cognition.

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**Session 7 [Wednesday, January 12, 20:30 - 22:00 (UTC +0)]**

**Session 5 [Wednesday, January 12, 07:00 - 08:30 (UTC +0)]**

## **A-0004 Evidence of greater Social Motor Synchrony in pairs of autistic children than neurotypical children: the importance of task type and social context**

Devyn Glass, Nicola Yuill

University of Sussex

Autistic and neurotypical people differ in how they socially interact. Some literature suggests autistic people display impaired Social Motor Synchrony (SMS), an element of social relationships that supports smooth exchanges, collaboration, and social-cognitive development. However, partners of different neurotypes can struggle to connect and empathise with one another (Milton, 2012). Literature mostly compares mixed (autistic, neurotypical) to matched-neurotypical pairs and SMS tasks can disadvantage autistic people and their partners (Glass & Yuill, under review).

We used Motion Energy Analysis to investigate SMS in familiar partners of the same neurotype: pairs of autistic and of neurotypical children. Partners played two collaborative activities, a specially designed dual-tablet activity (Connect) to support engagement and other-awareness (Holt & Yuill, 2017), and a shared-tablet activity (Colours) with no specific design. We coded videos for other-awareness, engagement, and enjoyment.

The autistic group showed similar levels of SMS in each activity, and SMS was significantly higher than chance. The neurotypical group showed levels of SMS in Colours similar to the autistic group but lower SMS in Connect, where they did not differ significantly from chance. The neurotypical group engaged less, needed more help, and expressed more negative affect during Connect than Colours, consistent with task problems.

Autistic partners can synchronise above chance level and to a similar, possibly greater degree than neurotypical partners under certain conditions. These findings indicate the importance of pair composition, social context, and task type on SMS for autistic compared with neurotypical children.

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**Session 10 [Thursday, January 13, 20:30 - 22:00 (UTC +0)]**

**Session 3 [Tuesday, January 11, 13:00 - 14:30 (UTC +0)]**

## **A-0006 What Minority Children Want to Know About In- and Out-groups, and How Knowledge Affects Their Intergroup Attitudes**

Yara Nassir, Gil Diesendruck, Meytal Nasie

Bar-Ilan University, Ramat-Gan, Israel

Social categorization has implications for how people think about ingroup and outgroup members, often leading to intergroup bias. This study investigates what minority children want to know about outgroups, and how knowledge affects their intergroup attitudes. The participants are Arab Muslim children living in Israel (goal-N=192), from two age groups (5-6 and 7-8 year-olds). The study starts with an assessment of participants' attitudes and essentialism towards outgroups ("Jews", "Scots"). Then, the experimenter shows participants a picture of an individual outgroup member, and asks them whether they want information about the target individual or his/her group. A week later, the experimenter provides participants neutral information according to one of three conditions: "no information about the outgroup", "information about the pictured individual outgroup member", or "information about the entire outgroup". Participants' attitudes and essentialism towards the outgroup are reassessed. We hypothesize that children will request category information more about outgroups than ingroup, and that providing information about individuals will lead to more positive attitudes and lower essentialism regarding the outgroups. Initial results on 18 5-6-year-olds are consistent with these hypotheses. Kindergarteners requested category information more about Jews ( $M=86.11$ ,  $SD=5.72$ ) than Scots ( $M=52.77$ ,  $SD=2.77$ ) and Arabs ( $M=9.72$ ,  $SD=2.77$ ), and vice-versa regarding individual information. Moreover, provision of information about Jewish individuals led to more positive attitudes toward Jews ( $MT1=0.33$ ,  $SD1=.49$ ;  $MT2=3.66$ ,  $SD2=.33$ ; scale 1-5), and lower essentialism regarding Jews ( $MT1=3.20$ ,  $SD1=.29$ ;  $MT2=1.54$ ,  $SD2=.17$ ; scale 1-5). This study may contribute to the potential of information provision for changing minority children's attitudes and essentialism towards outgroups.

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**Session 1 [Monday, January 10, 20:30 - 22:00 (UTC +0)]**

**Session 11 [Friday, January 14, 07:00 - 08:30 (UTC +0)]**

## **A-0007 Young children spontaneously invent three different types of Associative Tool Use Behaviours**

Eva Reindl<sup>1,2</sup>, Claudio Tennie<sup>3</sup>, Ian A. Apperly<sup>1</sup>, Zsuzsa Lugosi<sup>4</sup>, Sarah R. Beck<sup>1</sup>

<sup>1</sup>University of Birmingham, UK; <sup>2</sup>Birmingham City University, UK; <sup>3</sup>Eberhard Karls University, Tuebingen, Germany; <sup>4</sup>Kings College London, UK

The use of two or more tools in combination - Associative tool use (ATU) – has played a crucial role in human cultural evolution and is also part of chimpanzee tool cultures. Research into the cognitive processes underlying ATU produced evidence for the spontaneous invention of some forms of ATU in some non-human primate and bird species. In contrast, developmental studies with children have been sparse. Whether young children are also able to spontaneously invent different types of ATU and at what age this ability emerges is not well known. We aimed to start filling this gap in the literature with two experiments with samples of European, predominantly White preschoolers (E1: N = 66, 3y 6m - 4y 9m; E2: N = 119, 3y 0m - 6y 10m) who were administered a series of novel, non-verbal tool-use tasks measuring three different types of ATU: Tool set, Metatool use, and Sequential tool use. Children had 3 min per task and did not receive any demonstrations. Results from both experiments showed that from 3 years of age, children were able to spontaneously invent the three types of investigated ATU behaviours, suggesting that no immediate social learning was needed for the emergence of these behaviours. E2 showed that performance significantly increased with age. However, success rates were low, demonstrating that the spontaneous invention of ATU in novel tasks with brief exposure is challenging for preschoolers. The tasks add to the pool of tests that can be used to study problem-solving in humans and non-humans.

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**Session 10 [Thursday, January 13, 20:30 - 22:00 (UTC +0)]**

**Session 9 [Thursday, January 13, 13:00 - 14:30 (UTC +0)]**

**A-0008 The first causal meanings in the Russian toddler's speech**Elena Galkina<sup>1</sup>, Sofia Krasnosheko<sup>2</sup><sup>1</sup>Pavlov Institute of Physiology RAS, Russia, St Petersburg; <sup>2</sup>Institute of Linguistics RAS, Russia, St Petersburg

It is known that infants start developing causal thinking skills at the age of about 9 m. (Sobel, Kirkham 2006). In this study we ask how the Russian toddlers start expressing causality in the very beginning: what meanings come first? We regard a causal situation as two interrelated events that the speaker sees as dependent on each other.

The data: 14 typically developing Russian children aged 10–22 m., 280 earliest spontaneous one-two-words causal utterances, collected longitudinally, analyzed by functional semantical method. The first «causal phrases» noticed at the pre-verbal period (11-14 m.), by facial expressions and gestures. The first meaning is “problem and asking for help” (“thirsty, open the bottle”). Infants use a language for expressing the causality since about 13 m., at the one-word stage the semantics is “make it so that” expressed by words similar in function to causal verbs: 13-15 m. “request” (“dat” = give, “tuda” = move me there); 14-16 m. “effect of one’s own activities”: changing the state of a physical object (“babah” = destroy); changing one’s own condition (“cucu” = not visible).

At the 2-word stage the semantics become more varied, already at 22 m. they are able: to explain his request (“strashno, uberi” = scary, take it away; “nikak, pomogi” = can’t do it, help); to talk about the cause and effect of one’s own activities (“bakh, oooy” = throw, crashed; “gulya, buu” = a bird ran away, I scared it), indicate one’s own condition and its cause (“bo-bo, kus” = pain, bitten; “mukha, boyus” = fly, I’m afraid), give reasons for refusal (“nibudu, kruzhus” = won’t do anything more, I’m swinging; “nidam, mayo” = don’t give, it’s mine). Causal phrases correspond to the principle of functionality and subjectivity.

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**Session 11 [Friday, January 14, 07:00 - 08:30 (UTC +0)]**

**Session 3 [Tuesday, January 11, 13:00 - 14:30 (UTC +0)]**

## **A-0009 Examining differences in minority versus majority preschoolers on social categorization and perceived intergroup distance**

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<sup>1</sup>Laboratoire Ethologie, Cognition, Développement, Université Paris Nanterre, Nanterre, France;

<sup>2</sup>Laboratoire Parisien de Psychologie Sociale, Université Paris Nanterre, Nanterre, France

Social context plays an essential role in the development of social categorization which itself is at the basis of intergroup processes that precedes prejudice and discrimination (Bigler & Liben, 2006; Pauker et al., 2017). Here, we examined the impact of group membership on racial categorization and perceived cultural differences, among 4-to-6-year-old children, in low diversified schools (N = 87). We used a spontaneous social categorization task using pictures of children from 3 different racial groups broadly represented in France (Caucasians, Black- and North-Africans), and an evaluation of the perceived cultural distance between participants' in-group and the racial group represented in the picture, based on three items (eating habits, language, music). Results revealed an effect of age on racial categorization: the older the children, the more successful they are in this task,  $b = .04$ ,  $t(83) = 2.11$ ,  $p = .038$ . We showed a significant effect of the group represented in the photos on perceived cultural distance: members of minority groups (i.e., North- and Black-Africans) were evaluated as more different compared to those of the majority group on each of the items, e.g., eating habits,  $F(1,85) = 10.25$ ,  $p = .002$ ,  $\eta p^2 = .11$ . Finally, we got an interaction between participants' ingroup and the ethnic group represented in the pictures, for the language item,  $F(1,85) = 4.11$ ,  $p = .046$ ,  $\eta p^2 = .04$ : members of the majority group perceived as more different photographs representing minorities peers than those representing majority peers, while participants belonging to minority groups perceived no differences between photographs.

Keywords: preschoolers, racial categorization, cultural distance, numerical status, intergroup relations,

**<https://bcccd.slack.com/archives/C02PSCVFESG>**

**Session 10 [Thursday, January 13, 20:30 - 22:00 (UTC +0)]**

**Session 11 [Friday, January 14, 07:00 - 08:30 (UTC +0)]**

## **A-0011 Determining the cognitive processes involved in social category learning between 4- to 9 years old.**

Magali Mari<sup>1</sup>, Markus Paulus<sup>2</sup>, Fabrice Clément<sup>3</sup>

Cognitive Science Center, University of Neuchatel, Neuchatel, Switzerland (1); Department of Developmental Psychology, LMU Munich, Munich, Germany

Children like adults can predict the characteristics of others based on social category membership, but less is known about the mechanisms involved when children learn to associate characteristics with social category members.

The present study investigated whether 4- to 9-years-olds learn to associate characteristics to social category members based on labels, repetitive pairings, or both. Previous works showed that using a label upon the presentation of a category member's characteristic suffices to prompt children to generalize the characteristic to all category members wearing this label. Other works revealed that children need to be exposed repetitively to social category members and their characteristics to be able to generalize the characteristics to other members. This study aimed to investigate these mechanisms simultaneously and in interaction.

A total of 192 children were assigned to a control condition ("This person makes pots") and to one of three test conditions that manipulate how characteristics are presented: with labels ("This Kroller makes pots"), with repetitive pairings (75% of individuals make pots), or both in interaction (75% of "Krollers" make pots). Then children were introduced to a new individual from the same social category and asked to predict its characteristic. A pilot study revealed that 7–9-year-olds relied mainly on labels to make their predictions, whereas 4–6-year-olds relied mainly on repetitive pairings. Ultimately, the study's findings will provide further understanding of the mechanisms underlying social category learning.

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**Session 1 [Monday, January 10, 20:30 - 22:00 (UTC +0)]**

**Session 2 [Tuesday, January 11, 07:00 - 08:30 (UTC +0)]**

## **A-0012 Children and Adults Solve Pure Coordination Games Using Alignment of Intuitions.**

Daniel Perez-Zapata<sup>1</sup>, Xavia McKenzie-Smart<sup>1</sup>, Ian Charest<sup>2</sup>, Ian Apperly<sup>1</sup>

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In pure coordination games, players seek to coordinate responses with one another without communicating, in situations where there is no logically correct response. Success therefore depends upon players intuiting the response that is mutually obvious. Previous work highlights that such coordination requires a distinctive form of “group” thinking and sufficient mutual knowledge, but not the basis for the intuitive judgements themselves. Here, that question was addressed for the first time by examining the basis of coordination performance of groups whose intuitions might plausibly differ: children versus adults. Twenty-five 5-year-olds, 30 7-year-olds, and 25 adults undertook four types of coordination game (two visual and verbal tasks), and novel metrics allowed “intuitive alignment” in responses to be evaluated within- and cross-groups. All groups showed above-chance levels of intuitive alignment on all items of the tasks applying one-sample t-test comparisons (all  $t > 2.10$ , all  $p < .001$ ), and adults showed significantly higher levels of alignment than children through one-factor ANOVAs (all  $F > 8.06$ , all  $p < .001$ ). Analysis the patterns of intuitive judgements revealed both similarities and differences between children and adults. These findings are discussed in light of a new socio-cognitive phenomenon: alignment of intuitions.

<https://bcccd.slack.com/archives/C02Q2PCEE1F>

**Session 10 [Thursday, January 13, 20:30 - 22:00 (UTC +0)]**

**Session 3 [Tuesday, January 11, 13:00 - 14:30 (UTC +0)]**



## **A-0013 Infants' preference for speech is stable across the first year of life: Meta-analytic evidence**

Cécile Issard<sup>1</sup>, Sho Tsuji<sup>2</sup>, Alejandrina Cristia<sup>1</sup>

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Previous work suggested that humans' sophisticated speech perception abilities stem from an early capacity to pay attention to speech in the auditory environment. Previous studies have therefore tested if infants prefer speech to other sounds at a variety of ages, but provided contrasted results. In this paper, we make the hypothesis that speech is initially encoded similarly to other natural or vocal sounds, and that infants tune to speech during the first year of life as they acquire their native language. To test this hypothesis, we conducted a meta-analysis of experiments testing speech preference in infants, sorting experiments by whether they used native or foreign speech on the one hand, and vocal or non-vocal, natural or artificial sound on the other hand. Synthesizing data from 795 infants across 39 experiments, we found a medium effect size, confirming at the scale of the literature that infants reliably prefer speech over other sounds. However, this preference was not significantly moderated by the language used, nor vocal quality, or naturalness of the competitor. Strikingly, we found no effect of age: infants showed the same strength of preference throughout the first year of life. Speech therefore appears to be preferred from birth, even to other natural or vocal sounds. These results suggest that speech is processed in a specific way by an innate dedicated system, distinct from other sounds processing.

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**Session 1 [Monday, January 10, 20:30 - 22:00 (UTC +0)]**

**Session 2 [Tuesday, January 11, 07:00 - 08:30 (UTC +0)]**

## **A-0014 Making mistakes with Mr Hedgehog: Investigating representational change and causal learning in pre-schoolers using a novel digital online task**

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Many physical causal tasks do not allow mistakes to be corrected. According to Karmiloff-Smith's Representational Redescription Model, this may inadvertently impair children's learning, because self-correction may play a crucial role in progressing from more implicit and procedural representations to more explicit and abstract ones. Our previous study found that in 2.5-year-olds, self-correction in a trap-task may trigger partial representational change. However, questions still remain about the role of self-correction in representational change and the transition between implicit and explicit knowledge. The present study adapts the trap-task into a novel digital game about a hedgehog searching for food. Using the online science platform Gorilla, 2.5- to 3-year-olds (projected N = 150) either practiced the task while correcting their mistakes, without self-correction, or without self-correction but with the opportunity to achieve as much success as the self-correction group. All children then completed a transfer task in which a previous trap became a support, plus an optional interview. Explicit responses were measured using button-presses and interview answers; implicit responses were measured using webcam recordings of gaze direction. Data collection is ongoing, but we plan to conduct GLMM analyses to test the prediction that self-correction leads to more flexible learning of objects' trap/support roles, creating a significant difference in transfer performance between the children who self-corrected and the other conditions. We will also conduct exploratory analyses of implicit looks and their relationship to explicit performance, with the expectation that implicit looks may not differ across conditions in the same way as explicit measures.

**<https://bcccd.slack.com/archives/C02PHDR2Z0W>**

**Session 7 [Wednesday, January 12, 20:30 - 22:00 (UTC +0)]**

**Session 6 [Wednesday, January 12, 13:00 - 14:30 (UTC +0)]**

## **A-0017 Don't You (Forget About Me) – The developmental trajectory of the social memory effect in great apes**

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Social context enhances encoding of objects in primates, including humans („social memory effect“). In a study with human infants, 9-month-olds processed a block tower better when it was built by a social compared to a nonsocial agent (Howard & Woodward, 2019). The same effect was found in adult primates (capuchin monkeys, chimpanzees and gorillas (Howard et al., 2017, 2018)). In extending these findings, the current study aims to investigate the social memory effect in four great ape species (chimpanzees, orangutans, bonobos, gorillas) ontogenetically (infancy to adulthood). Similar to the paradigm by Howard and colleagues, great apes are familiarized with videos of a social (hand) vs. a non-social (claw) model building a block tower. In a subsequent preferential-looking phase, the familiarized tower is presented next to a novel tower. As a measure of stimulus encoding, we use the participants' proportional looking time at the novel tower. We assume that a greater novelty response indicates an enhanced processing of the familiarized stimulus. Furthermore, we aim to investigate how long-lasting this effect is by retesting the novelty preference after a delay of two days. Data collection is currently ongoing, and we are planning to present preliminary data of 21 chimpanzees at the conference. In addition, we will investigate the physiological basis of the social memory effect by measuring the participants' heart rate before and during stimulus presentation with a contact-free measurement. With this project we hope to better understand how social context influences memory in great apes over the course of ontogeny.

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**Session 7 [Wednesday, January 12, 20:30 - 22:00 (UTC +0)]**

**Session 11 [Friday, January 14, 07:00 - 08:30 (UTC +0)]**

## **A-0018 Understanding how child interaction changes with touchscreens: Conceptualising cycles of communication and action**

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Touchscreens have, in a relatively brief period of time, become commonplace in many of our daily interactions. However, what this means for how we learn, develop and interact with each other is of great public debate and is still being negotiated across a range of research fields (cf. Hassinger-Das et al. 2020).

Here we draw from our recent mixed-methods study of how 2-year-old children's communication changes in adult-child shared interactive touchscreen sessions, compared with similar adult-child interactions featuring the traditional activity of shared book-reading.

The analysis reveals how children's pattern of action changes with touchscreens, as children perform a comparable number of actions but talk considerably less compared to the shared book readings with adults.

A conclusion from this would be that children communicate less and are more engaged with the screen. However, a multimodal qualitative analysis shows that children do not simply ignore the interacting teachers rather respond to a teacher question with a digital touch action.

We discuss this changing character of child communication with recent strands in the cognitive sciences concerned with embodiment and enaction (McGann et al. 2013). We propose the concept of "cycles of communication and action" as a dynamic way of understanding how touchscreen actions are part of interaction in a way that is communicational and simultaneously changes the object at hand, moving interaction forward in a secondary manner.

We discuss the findings, theoretical framing, and implications that this perspective carries for understanding contemporary interaction and what this can entail for educational settings.

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**Session 8 [Thursday, January 13, 07:00 - 08:30 (UTC +0)]**

**Session 3 [Tuesday, January 11, 13:00 - 14:30 (UTC +0)]**

## **A-0020 The robot who could do wrong: Comparing a social robot and a human in a selective trust task**

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Social robots embody many different social behaviours which distinguish them from other interactive technologies. In spite of this unique capacity, there is potential for social robots to fail in settings such as classrooms, where the social processes which surround social learning from humans may not generalise to interactions with robots. Consequently, the goal of this study was to compare a robot and a human agent in a selective trust task across different combinations of reliability (both agents reliable, only human agent reliable, or only robot agent reliable). Ninety-four children aged 3-6 participated in an online study where they viewed videos of a human and a robot agent labelling familiar and novel objects. We found that, although children consistently preferred to endorse a novel object label from the agent who previously labelled familiar objects correctly, independent of if this was a human or a robot, their social evaluations tended much more towards a general robot preference. When both the human and the robot were previously reliable, children's preferences also indicated a robot bias. Children's conceptualisations of agency when making a mistake also differed, such that an unreliable human was selected as doing things on purpose, but not an unreliable robot. These findings suggest that children's perceptions of a robot's reliability is separate from their evaluation of its desirability as a social interaction partner and its perceived agency. Further, they indicate that a robot making a mistake does not necessarily have a negative effect on children's desire to interact with it.

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**Session 11 [Friday, January 14, 07:00 - 08:30 (UTC +0)]**

**Session 9 [Thursday, January 13, 13:00 - 14:30 (UTC +0)]**

## **A-0021 The Importance of Sleep Duration: Attentional and Externalizing Problems in Preschoolers of Depressed Mothers**

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Background: Maternal depression is associated with many sleep problems (Schultz et al., 2020) and attentional and externalizing problems in children (Goodman et al., 2011). Given its critical role in facilitating emotion and behavior regulation (Mindell et al., 2017), sleep duration may buffer the effect of maternal depressive symptoms on child behavior problems. We hypothesize sleep duration moderates the impact of maternal depression on attention and externalizing problems for children whose mothers have high symptoms, but not children whose mothers have low symptoms. Methods: We used publicly available wave-4 data (5-years-old) from the Fragile Families and Child Wellbeing Study (N = 3742; female = 1794). Maternal depression was measured by the Composite International Diagnostic Interview-Short Form; 1 = clinical, 0 = non-clinical symptoms). Sleep duration was the mother-reported number of hours the child slept on weeknights. Attentional and Externalizing Problems were measured by the Child Behavior Checklist. Results: We tested the interaction hypothesis with multiple regression and simple slopes analysis, controlling income and maternal relationship status. Increased sleep duration predicted decreased attentional problems in children of depressed mothers ( $\beta = -0.11$ ,  $p < 0.05$ ) but not mothers without depression ( $p = 0.99$ ). Increased sleep duration predicted decreased externalizing problems in children of both depressed mothers ( $\beta = -0.19$ ,  $p < 0.05$ ) and mothers without depression ( $\beta = -0.05$ ,  $p < 0.05$ ). Discussion: Longer sleep duration was associated with fewer attentional problems among children of depressed mothers, suggesting sleep duration buffers the effect of maternal depression on child attention and behavior problems.

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**Session 5 [Wednesday, January 12, 07:00 - 08:30 (UTC +0)]**

**Session 9 [Thursday, January 13, 13:00 - 14:30 (UTC +0)]**

**A-0022 Human infants' processing of action-magnitude couplings**

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Humans from birth possess an Approximate Number System (or ANS), which allows representing large numerosities without counting (Dehaene, 2011). This system is connected to the magnitude dimensions of space and time from birth on (e.g., de Hevia et al., 2014). While recent research has explored the relation the action-magnitude link (e.g., Namdar et al., 2013), and although this link is supported by overlapping parietal regions in the adult brain (e.g., Walsh, 2003), little is known about its origins and developmental course. With this study, we aim at extending this body of research by investigating infants' ability to connect action and size information before the end of the first year of life. We tested 7- to 8-month-old infants in their ability to learn, and generalize, action-size pairings. Infants were first familiarized with a Pacman character displaying different mouth openings directed to an object, which could be either congruent (e.g., big mouth opening aiming for a big object) or incongruent (e.g., small mouth opening aiming for a big object). In the test trials, all infants observed both congruent and incongruent pairings containing new action-object scenarios. Preliminary results show that infants habituated with the congruent condition looked longer at the incongruent test trials, while infants habituated with the incongruent condition looked equally long at both test trials. Therefore, infants appear to be sensitive to the congruency between actions and size information from very early in life.

<https://bcccd.slack.com/archives/C02Q2PAPTND>**Session 7 [Wednesday, January 12, 20:30 - 22:00 (UTC +0)]****Session 5 [Wednesday, January 12, 07:00 - 08:30 (UTC +0)]**

**A-0023 Benefits of choir singing at school on social interaction, learning and well-being in 8 to 10-old children from deprived urban areas.**

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In the last two decades, a growing literature showed benefits of engagement with music on several aspects of social (e.g. Kirchner & Tomasello, 2010; Rabinovitch et al., 2013), academic (e.g. Hallam et al., 2010) and personal development in children (e.g. Welch et al., 2014). However, these studies mainly include instrumental learning and music education, with choral singing being poorly investigated especially in children. The few studies on the effects of choral singing in adults and adolescents show positive effects on self-esteem and feeling of social inclusion (Ashley, 2002; Dingle, 2013). Our aim here was to test the effect of choral singing in children on academic achievement, social interactions and wellbeing. This study was part of a music education program (three years of intensive choral singing practice at school) implemented in two schools located in deprived areas in Paris and its suburb by a public institution for music education and culture ("La Philharmonie de Paris"). In a longitudinal study, we evaluated 95 children from age 8 to 10 on three social interaction tasks (sharing, cooperation and helping), on school learning abilities using the BMT test, and on wellbeing using questionnaires. We compared the evolution of these children with those of a control group. We found beneficial effects of choral singing on sharing and cooperation with peers and also on repetition of difficult sentences in a grammatical task, but no transfers to other school competencies. Potential effects on wellbeing remain unclear because of a variability among school institutions.

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**Session 7 [Wednesday, January 12, 20:30 - 22:00 (UTC +0)]**

**Session 2 [Tuesday, January 11, 07:00 - 08:30 (UTC +0)]**



## **A-0024 Automatic Quantification of Children's Lived Experience**

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One core assumption in developmental psychology is that children's cognition develops in interaction with their social and physical environment. One way to study this relation is to code interactions from video recordings of children's daily activities. However, this coding is usually done by hand and therefore very labor-intensive.

Modern Computer Vision (CV) techniques – such as automatic people and object detection – can significantly reduce this effort and thereby facilitate the study of cognitive development. We want to use these techniques to evaluate a dataset of children's daily activities. That is, we want to automatically quantify children's interactions with people and objects. For this, we are collecting video recordings at home and in kindergartens using small lightweight bodycams. So far, we have recorded ten hours of videos from six children. To evaluate the accuracy of various models, we hand-coded a subset of videos.

Antecedently, we have compared 11 state-of-the-art CV detectors for people and objects against the hand-coded subset of videos. The detection accuracy is between 30-35%, leaving room for improvement. We identified key limitations of the state-of-the-art models by specifying systematic detection errors (i.e. conditions under which the model fails to detect a person). This is the basis for improving our processing pipeline.

Our next step is to improve the state-of-the-art models by fine-tuning or changing the model architecture. Once the detection is sufficiently accurate, we want to use these models to study the effect of children's daily activities on their cognitive development at a scale.

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**Session 1 [Monday, January 10, 20:30 - 22:00 (UTC +0)]**

**Session 12 [Friday, January 14, 13:00 - 14:30 (UTC +0)]**

## **A-0025 Older but not younger, children adapt their decisions about which game to practice more to maximize test performance**

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<sup>3</sup>Technical University Munich, Germany

This study investigates whether 4- to 7-year-old children tailor their learning choices, focusing on boosting their strengths versus compensating their weaknesses, depending on the task characteristics, to maximize test performance. Children are familiarized with a very easy and a very difficult guessing game. Children can then choose which game they want to practice before entering the test phase. In a within-subjects design, we manipulate whether children are told they can choose which game to be tested on (choice condition) or whether the computer will select the game they will be tested on (no-choice condition).

Data collection is still ongoing, but preliminary results (n=106) suggest that while younger children decided to practice the easy game irrespective of condition, 7-year-olds adapt their training choices: They practiced the easy game in the choice condition to boost their strengths and ensure the maximum final score, but the difficult game in the no-choice condition, to compensate their weaknesses and maximize the average expected final score.

Interestingly, we also found that most of the 6- and 7-year-olds who decided to practice the difficult (i.e., more exciting) game in the choice condition nevertheless chose to get tested on the easy (i.e., boring) game and obtained the maximum score. In this sense, their learning choices reveal a sophisticated awareness of their strengths and weaknesses, allowing them to enjoy the game more while ensuring maximum performance. We will further explore these patterns in a series of follow-up studies.

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**Session 1 [Monday, January 10, 20:30 - 22:00 (UTC +0)]**

**Session 5 [Wednesday, January 12, 07:00 - 08:30 (UTC +0)]**

## **A-0026 Tracking of rhythmic speech and non-speech stimuli by the developing infant brain**

Aine Ni Choisdealbha, Adam Attaheri, Sinead Rocha, Natasha Mead, Helen Olawole-Scott, Christina Grey, Perrine Brusini, Samuel Gibbon, Declan Hines, Panagiotis Boutris, Sheila Flanagan, and Usha Goswami

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One of the features distinguishing infant-directed speech (IDS) from adult-directed speech is the structure of the amplitude envelope, which contains more power in its slow modulations in IDS (Leong et al., 2017). Research with older children shows that the accuracy with which the brain tracks these slow modulations is related to performance on standardised reading and phonological assessments (Power et al., 2013). We ask whether individual differences in the cortical oscillatory response to audiovisual stimuli similar to those used by Power et al. can be measured early in life, and whether these responses relate to the earliest stages of language development.

As part of a multi-measure, large-scale longitudinal study (BabyRhythm), EEG was recorded from 114 infants at six and nine months as they listened to syllables and drumbeats repeating every 500ms, compared with recording EEG during silence. Inter-trial coherence (ITC) was computed to examine whether a stimulus-induced oscillatory response was present. Analysis using a linear mixed effects regression showed a significant interaction between recording condition and frequency band ( $F(2, 822) = 6.53, p = 0.0015$ ), corresponding to an increase in ITC at 2Hz in the repeated syllable condition and the drumbeat condition relative to the silent condition. There was no significant effect of nor interaction with age.

The data suggest that the infant brain is equipped to track simple rhythmic inputs. Our next step is to examine whether individual differences in cortical tracking relate to early measures of phonology, vocabulary, grammar, and rhythm.

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**Session 1 [Monday, January 10, 20:30 - 22:00 (UTC +0)]**

**Session 6 [Wednesday, January 12, 13:00 - 14:30 (UTC +0)]**

## **A-0027 The structure of executive functions in preschool children and chimpanzees**

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Executive functions are a suite of domain-general cognitive control processes including working memory, inhibitory control, and attention shifting. Psychometric research with adult humans has produced evidence for unity and diversity in the structure of executive functions. Developmental studies with preschool children, in contrast, favour a 1-factor model. How executive functions might be structured in nonhuman primates is unknown to date. In the current study, we sought to fill this gap in the literature by conducting a comparative, multi-trait multi-method test battery on executive functions with a sample of preschool children (N = 185) and chimpanzees (N = 55). The test battery aimed at measuring working memory updating, inhibition, and attention shifting with three non-verbal tasks per construct (9 tasks in total) that differed in their peripheral task demands. The tasks revealed response signatures suggesting that they indeed measured the target cognitive abilities. Results showed that for both children and chimpanzees the correlations between task performances were low to moderate in strength and not confined to tasks within the same executive functions domain. Factor analyses produced some evidence for a 1-factor model for children and chimpanzees. However, in neither case the 1-factor model conclusively fitted the data better than a 2- or 3-factor model. We discuss the implications of our findings with respect to the ecological validity of current psychometric research.

<https://bcccd.slack.com/archives/C02P9FKNWLF>

**Session 1 [Monday, January 10, 20:30 - 22:00 (UTC +0)]**

**Session 6 [Wednesday, January 12, 13:00 - 14:30 (UTC +0)]**

## **A-0028 Spontaneous attentional refreshing in school-aged children: an examination of the effects of free time and motivation**

Beatrice Valentini, Evie Vergauwe

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Working memory is the limited-capacity cognitive system in charge of maintaining information no longer perceived. Several mechanisms are assumed to support the substantial improvement in working memory observed during childhood; attentional refreshing is one of those mechanisms.

Refreshing is an attention-based maintenance mechanism in working memory, which improves the accessibility of mental representations. It is assumed to operate serially, with the focus of attention cycling from one mental representation to the other, in order to sequentially reactivate every to-be-maintained item. Even though it has been suggested that its efficiency increases between 7 and 14 years old, recent results seem to contradict this notion. In fact, by using a recently-developed index to detect the occurrence of refreshing, i.e., the last-presented benefit, no sign of attentional refreshing was found until the age of 11 (Vergauwe et al., 2021).

This pre-registered project used the last-presented benefit to test whether children aged 7 and 11 years olds can spontaneously perform refreshing when sufficiently motivated in an optimal task setting. In particular, relative to Vergauwe et al. (2021) we made the free time to refresh more apparent, and we manipulated the level of motivation (high vs. neutral) involved in the task, through the use of an age-appropriate narrative in the high motivation condition.

The results show that the motivational manipulation did not influence the occurrence of attentional refreshing; children did not refresh in any of the conditions. This indicates that the occurrence of spontaneous refreshing in children may be task-dependent and limited to specific situations.

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**Session 10 [Thursday, January 13, 20:30 - 22:00 (UTC +0)]**

**Session 6 [Wednesday, January 12, 13:00 - 14:30 (UTC +0)]**

## **A-0029 Ascribing intentional action in a moral dilemma**

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University of Göttingen

Making sense of each other's actions is fundamental to our social lives. Intentions and actions, however, can be subjective. Subjective in the sense that a person does many things simultaneously (moving her fingers, using a lighter, detonating dynamite) but the intentionality of those actions depends on the description under which she acts (detonate dynamite in order to “clear entrance” or “kill someone”). How foreseen harmful effects of actions are evaluated regarding their intentionality and responsibility is an open question. Recent empirical work showed that the structure of acts might be represented in act trees (Levine, Leslie, et al., 2018) and this representation is itself influenced by moral evaluations (Knobe, 2010; Levine, Mikhail, et al., 2018). Based on theoretical work (Goldman, 1970) we derived statements depicting intentional acting and developed response patterns indicative for particular act trees. Two preregistered online studies tested adults' (N=222) and children's (N=116, 8-10y.) understanding of intentional actions in a moral dilemma. Results favored a “strict” notion of intention (Masek, 2010) – adults and children represented a harmful effect as an unintended side-effect even though acts generating the harm were intended. Two additional conditions in which the agent stated a motive either for the bad or good effect tested underlying presuppositions. In ambiguous situations (when no motive was stated) subjects rated the agent's intentionality and responsibility as when he explicitly stated his good intentions. However, children rated the moral permission of the basic action that led to the harmful effect considerably lower than adults.

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**Session 8 [Thursday, January 13, 07:00 - 08:30 (UTC +0)]**

**Session 9 [Thursday, January 13, 13:00 - 14:30 (UTC +0)]**

## **A-0030 How do infants process prosocial/antisocial scenarios and characters? Insights from an EEG study**

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A growing literature suggests that infants evaluate agents based on their prosocial/antisocial actions, preferring agents who are helpful versus unhelpful to others (for review, see Margoni & Surian, 2018). However, the cognitive and emotional processes underlying these evaluations remain insufficiently clear, partly because it is difficult to directly measure mental processes in preverbal infants through behavioral observation. Although recent studies have begun to approach this problem by exploring the neural mechanisms underlying infants' behavioral responses to sociomoral scenarios (Cowell & Decety, 2015; Gredebäck et al., 2015), these studies were based on relatively small samples and focused on distinct aspects of sociomoral responding. To overcome these limitations, the current study systematically examined infants' neural responses both to prosocial/antisocial interactions and to prosocial/antisocial characters, using larger samples and two distinct age groups. We found that 6-month-olds showed higher relative right frontal alpha power (indexing approach motivation) when viewing helping versus hindering scenarios, suggesting that prosocial (vs. antisocial) interactions elicit more approach motivation. Analyses of infants' neural responses toward images of the helper versus hinderer revealed that both 6- and 12-month-old infants showed differential event-related potential (ERP) responses in the P400 and N290 components (indexing social perception) but not in the Nc component (indexing attentional allocation), suggestive that infants' neural responses to prosocial versus antisocial characters reflect social processing. Together, these findings provide a more comprehensive account of infants' neural responses to prosocial/antisocial interactions and characters, and support the hypothesis that both motivational and socially relevant processes are implicated in infants' sociomoral responding.

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**Session 4 [Tuesday, January 11, 20:30 - 22:00 (UTC +0)]**

**Session 3 [Tuesday, January 11, 13:00 - 14:30 (UTC +0)]**

## **A-0031 The relationship between executive function and persistence in 5-year-olds**

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Persistence is considered a factor that can predict children's future academic achievement. However, few studies examine the factors contributing to individual differences in children's persistence. We hypothesized that children's executive function (EF) was related to their persistence, since EF is also an important predictor of future academic achievement. In this study, we investigated the relationship between the two abilities—EF and persistence—among 5-year-old children (N = 39). In addition, the current study investigated whether there is the relationship between parental socioeconomic status (SES) and children's EF, as well as parental grit and children's persistence. We found that scores of Dimensional Change Card Sort (DCCS) task among cool EF tasks, and scores of gift delay task among hot EF tasks were positively associated with children's persistence. However, we did not find associations between parental characteristics (SES or grit) and children's EF/persistence. Moreover, we conducted a mediation analysis to examine these psychological mechanisms underlying the associations between each task and persistence. We found that children with high scores on the DCCS task used many strategies to work on the persistence task, and using multiple strategies contributed to their persistence. We also found that children with high scores on the gift delay task concentrated on the task without looking at distractions, and this approach contributed to their persistence. The present findings thus emphasize the factors related to individual differences in children's persistence and psychological mechanisms underlying these associations between children's EF and persistence.

<https://bcccd.slack.com/archives/C02Q2P980DP>

**Session 8 [Thursday, January 13, 07:00 - 08:30 (UTC +0)]**

**Session 3 [Tuesday, January 11, 13:00 - 14:30 (UTC +0)]**



## **A-0032 If I had an imaginary companion, would I have been different? How counterfactual reasoning, analogical learning, cognitive flexibility, theory of mind, sharing- and play behavior changes in children with imaginary companions**

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During make-believe and pretend play, children create imaginary scenarios and alternative worlds, assume and play different identities and roles, from princesses rebelling to their evil king, to brave cowboys, and pirates conquering the Seven Seas. Some children are more intensely involved in pretense play than others, and are constantly immersed in the augmented reality they have created--children with "imaginary companions". Imaginary companions are real for the children, but are not visible to the outside world. Although prior research suggests that pretend play and causal cognition are closely connected, only limited work has been focused on imaginary companions. This project investigates the impact of having an imaginary companion on 4- to 8-year-old children's (n = 62) cognition and behavior. In particular, we administered children a battery including six classical tasks on children's cognitive flexibility, analogical reasoning, counterfactual- and divergent thinking, theory of mind, play- and sharing behavior, and vocabulary skills. The results of this study show no differences between children with or without imaginary companions, across any of these measures. In this sense, on the one hand, our study does not support the often-proposed hypothesis that children with imaginary companions may have enhanced social and cognitive skills thanks to their constant, serious pretend-play training. On the other hand, our results also suggest that the phenomena does not have a negative effect on any aspect of children's development. We discuss possible interpretations for the observed results, as well as the implications of these results for future research.

<https://bcccd.slack.com/archives/C02QDS1UV96>

**Session 8 [Thursday, January 13, 07:00 - 08:30 (UTC +0)]**

**Session 9 [Thursday, January 13, 13:00 - 14:30 (UTC +0)]**

## **A-0033 Development of the discriminative and metacognitive ability on the visual experience of natural scene images**

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Previous research showed that adults can discriminate between what they have seen or not with high confidence in a momentary (<133ms, masked) visual experience (Liang et al., 2019). However, how and when children develop the discriminative and metacognitive ability (e.g., high confidence with correct trials and low confidence with incorrect trials) for visual experience is still unclear. In the present study, we examined these abilities in 5-12-year-old children and adults using a paradigm developed by Liang et al. Twenty-five 5-6-year-old, thirty-six 7-9-year-old, thirty-one 10-12-year-old, and thirty-three adults participated in an online experiment. In each trial, participants were presented with a natural scene image (e.g., a woman cooking in a kitchen) for 267ms first, and then presented some image patches. The image patches consisted of present patches (made from the target image) and absent patches (made from different images). Participants were asked to judge whether the image patch was present or absent in the target images with high or low confidence. There are no age effects on discriminative and metacognitive performance. Therefore, children can discriminate between what they have seen or not with high confidence in a momentary visual experience. Interestingly, there was an age effect on the metacognitive performance on the absent patch. This suggests that it is difficult for children to identify what was not experienced with confidence. The present study was the first to examine the development of children's rapid natural scene perception. The findings contribute to the understanding of the development of visual experience.

<https://bcccd.slack.com/archives/C02P9FJRGUF>

**Session 5 [Wednesday, January 12, 07:00 - 08:30 (UTC +0)]**

**Session 12 [Friday, January 14, 13:00 - 14:30 (UTC +0)]**

## A-0036 Verbal and Gestural Differences in Child-Directed and Adult-Directed Speech

Songül Kandemir<sup>1</sup>, Merve Sezer<sup>2</sup>, Hazal Civelek<sup>1</sup>, Asude Firdevs Eraçıkbaş<sup>3</sup>, Aslı Aktan Erciyes<sup>1</sup>

<sup>1</sup>Kadir Has University, Turkey; <sup>2</sup>Istanbul University, Turkey; <sup>3</sup>Boğaziçi University, Turkey

Recipient design theory emphasizes the use of language structure depending on the addressee's need. We use more sophisticated language when communicating with adults (Ravid, 2005). On the other hand, when there is a child addressee we use less complex language to maintain comprehension (Iverson et al., 1999). Studies also show that different addressees elicit differences in speech and co-speech gestures (Dunst et al., 2012). Findings show that adults use more iconic gestures addressing children compared to adults (Campisi & Özyürek, 2013). Present study investigates how speech and co-speech gestures change in adult-directed speech (ADS) vs. child-directed speech (CDS) for three different tasks.

Forty-one participants (Mage=22.04) attended online zoom for two different conditions (ADS-CDS) with three different tasks (story-reading-task, storytelling-task, and address-description-task) in a within design. They were instructed to pretend either communicating to a child or an adult. We hypothesized that participants will use more complex language and less iconic gestures in the ADS condition compared to the CDS. Results showed that, for CDS, participants used more iconic gestures in the story-reading-task ( $M=.03$ ,  $SD=.045$ ) compared to ADS ( $M=.01$ ,  $SD=.037$ ) ( $t(40)=-2.618$ ,  $p=.012$ ). There were no differences for story-telling and address-description tasks. Additionally, language complexity did not differ across tasks and conditions.

Findings indicate that speakers might modify gestures considering the addressee depending on task at hand. The difference occurred only for story-reading-task which required the least cognitive load among the three tasks. Results will be discussed at the intersection of language production theory (Bock & Levelt, 1994) and recipient design theory.

<https://bcccd.slack.com/archives/C02PSCQ4HM2>

**Session 8 [Thursday, January 13,07:00 - 08:30 (UTC +0)]**

**Session 12 [Friday, January 14,13:00 - 14:30 (UTC +0)]**

**A-0037 Newborns take into account the communicative dimension of language**Bálint Forgács<sup>1</sup>, Tibor Tauszin<sup>2</sup>, György Gergely<sup>2</sup>, Judit Gervain<sup>3</sup><sup>1</sup>Eötvös Loránd University (ELTE), Budapest, Hungary; <sup>2</sup>Central European University (CEU), Budapest, Hungary; <sup>3</sup>Università di Padova, Italy

Newborns show greater brain activation to pseudowords with a repetition (ABB: “mufefe”) as opposed to no repetition (ABC: “selagu”), which suggests a sensitivity for linguistic structure from birth. We investigated, using fNIRS, whether newborns’ brains are further activated if linguistic stimuli are embedded in a structured communication of two voices. 1-3-day-olds were presented with pseudowords containing a repetition pattern (ABB) auditorily in three conditions: 1) different pseudoword tokens (ABB-CDD) produced by a female and a male voice taking turns, suggesting information transmission; 2) pairs of pseudowords repeated by a female and a male voice identically (ABB-ABB), and thus not allowing transmission of information; 3) different pseudowords (ABB-CDD) as in condition 1, but produced by a single speaker, i.e. lacking turn-taking. Of the three conditions, only condition 1 satisfies the two criteria for communicative transfer of information: the presence of turn-taking signal exchange between multiple social agents and the exchange of partially variable messages necessary for information transfer. Fronto-temporal areas of newborns responded bilaterally with greater activation to the first, communicative condition than to either of the other two conditions. Our results suggest that newborns are sensitive to the communicative function of language use, that is, that it can transmit information – and not merely to its physical properties or its abstract structural features. Furthermore, the findings demonstrate that newborns show special sensitivity to recognize communicative information transfer between third party agents, outside the dyadic interactions between themselves and caretakers.

**<https://bcccd.slack.com/archives/C02QDRXHP7A>**

**Session 1 [Monday, January 10, 20:30 - 22:00 (UTC +0)]**

**Session 9 [Thursday, January 13, 13:00 - 14:30 (UTC +0)]**

## A-0038 Young Children Selectively Trust Informants Who Explain as They Predicted

F. Ece Ozkan<sup>1</sup>, Aylin C. Küntay<sup>1</sup>, Bahar Koymen<sup>2</sup>

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Children critically evaluate the information and make inferences about what to trust and whom to trust. In this online study, we examined whether 5- to 6-year-old children (N=48, Mage=5,54) selectively trust informants who provide explanations in line with their own predictions. Participants were introduced to an informant who was to explain a given topic (e.g., what makes cars go). Before they heard the informant's explanation, they chose one explanation among three, i.e., two relevant (e.g., pressing the gas pedal makes a car go) and one irrelevant explanation (e.g., when I am in the car, I watch outside the window), as their prediction of how the informant would explain the topic. They predominantly predicted a relevant explanation. We manipulated whether the informant's explanation matched that of the child's resulting in three within-subjects conditions: 1)relevant-match, the informant provided the same relevant explanation, 2)relevant-mismatch, the informant offered the relevant explanation that the child did not choose, and 3)irrelevant-mismatch, the informant provided the irrelevant explanation. The participant's epistemic trust was measured by three questions 1)Did the informant explain the topic well? 2)Would you ask the informant to learn about [a new relevant topic]? and 3)Would you team up with the informant in a quiz game? Overall, participants were more likely to trust the informant in the relevant-match condition compared to the two mismatch conditions. Interestingly, children did not favor the relevant-mismatching informant over the irrelevant-mismatching informant. Thus, young children predict people to provide relevant explanations and selectively trust those who explain as they predicted.

<https://bcccd.slack.com/archives/C02PQ5U38JX>

**Session 11 [Friday, January 14,07:00 - 08:30 (UTC +0)]**

**Session 12 [Friday, January 14,13:00 - 14:30 (UTC +0)]**

## **A-0039 Cues Infants Use to Represent Leadership**

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Infants distinguish between fear-based (bullying) and respect-based power (leadership), but it remains unclear which specific cues they use. Here, we demonstrate that the act of bowing (which matches deference displays found across cultures, and subordination displays among other species) suffices in generating the representation of legitimate leadership. We tested this by assessing whether 21-month-olds expect agents to obey a character if they have previously bowed for it, paid tribute to it, or received a benefit from it. Infants saw three geometric agents bowing to a character who then instructed them to go to bed, and they either complied while it watched but disobeyed after it left (disobedience), or continued to comply after it left (obedience). Infants looked reliably longer at disobedience than at obedience, indicating that they expected agents to keep obeying. Experiment 2 replicated the finding with slightly different stimuli. Control Experiment 3 showed the same events as Experiment 2 except that agents no longer bowed, they instead moved back-and-forth sideways. Now infants no longer expected obedience nor disobedience. In Experiment 4, the character conferred a benefit to the group giving them a ball to play. Infants did not generate clear expectations. In Experiment 5, the character received a tribute (the ball) from the group. Now, infants looked longer at obedience, suggesting they expected the agents to disobey, consistent with prior findings that they expect disobedience of dominant, but not respected, leaders. These findings suggest that (Norwegian) 21-month-olds use bowing as a cue for representing leadership.

**<https://bcccd.slack.com/archives/C02PQ5082AE>**

**Session 7 [Wednesday, January 12, 20:30 - 22:00 (UTC +0)]**

**Session 8 [Thursday, January 13, 07:00 - 08:30 (UTC +0)]**

## **A-0041 Co-EnACT framework: How technologies can act as tools to support the development of collaboration in young neurotypical and autistic children**

Nicola Yuill

Children & Technology Lab, School of Psychology, University of Sussex, UK

Collaboration underlies the formidable human construction of complex cultural systems, as suggested by the Vygotskian Intelligence Hypothesis. Children develop social-cognitive capabilities in moral and social understanding through interacting with others. Increasingly, the different tools of digital technology mediate those interactions at school and at home. Technology design can push for social isolation or for collaboration.

This paper describes the Co-EnACT framework for understanding how technology can support collaborative development, with evidence showing how technology design (e.g. touch surfaces, augmented toys) influences shared engagement, joint attention and shared control to support better collaboration.

Two previously-reported datasets are re-analysed to illustrate the utility of the framework.

Study 1: Video analysis of 11 triads of 7-11 year-olds playing with an augmented toy vs. an unaugmented one illustrates three technology features supporting collaborative narrative construction: how audio effects capture initial engagement, how playset design increases the probability of success of attention bids, how that increased attention capture then feeds longer sequences of cooperative play and finally, how cooperative play supports more collaborative narrative co-construction.

Study 2: Connect is a communication app designed using the framework. Videotapes of pairs of minimally-verbal autistic children with shared vs single tablets illustrate how sharing control while constraining individual action supports collaboration through contingent action.

The two examples address aspects of interaction – shared engagement, attention, contingency and control - that contribute to development of collaboration. Comparison of the two participant groups suggests different patterns of collaboration, raising theoretical questions about variation between neurotypical and neurodiverse developmental pathways.

**<https://bcccd.slack.com/archives/C02PQ4YJXEW>**

**Session 1 [Monday, January 10, 20:30 - 22:00 (UTC +0)]**

**Session 9 [Thursday, January 13, 13:00 - 14:30 (UTC +0)]**

## **A-0042 The ANS is linked to and longitudinally predicts symbolic math skills in young children**

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Recent findings suggest a specific association between the acuity of the approximate number system (ANS) and early formal symbolic mathematical abilities in young children (e.g., Starr et al., 2013). However, it has also been suggested that this relationship might be affected by general intelligence and/or inhibition (Szucs et al., 2013). Here, we provide the results of a longitudinal study, where 60 infants were tested at twelve months old (T1) and again at four years of age (T2), to investigate the relationship between non-symbolic and symbolic number skills, both at T2 and longitudinally. While at 12 months we only measured the infants' ANS acuity, at 4 years we tested them with multiple tasks such as the ANS acuity, the ability to spontaneously focus on number (SFON; Hannula & Lehtinen, 2005), the ability to apply the counting principles (Give a Number task, Le Corre & Carey, 2007) and to perform simple arithmetic operations (Tedi-Math; Van Nieuwenhoven et al., 2001). At T2 we also tested general inhibitory skills (NEPSY-II; Korkman et al., 2014.) and general intelligence (WPPSI-IV; Wechsler, 2012). We found that at four years of age, children's ANS acuity significantly correlates with their symbolic mathematical skills even after controlling for inhibitory control and general intelligence. Moreover, longitudinal analyses revealed that the ANS measured at 12 months significantly predicted the later symbolic math skills even when controlling for general intelligence. Together these results support the idea that ANS has an early, specific, and longstanding link with symbolic mathematical abilities.

**<https://bcccd.slack.com/archives/C02PM6M798D>**

**Session 7 [Wednesday, January 12, 20:30 - 22:00 (UTC +0)]**

**Session 9 [Thursday, January 13, 13:00 - 14:30 (UTC +0)]**



## **A-0043 Who is the teacher? Young children can differentiate between pedagogical and information-seeking questions based on prosody alone**

Igor Bascandziev<sup>1</sup>, Patrick Shafto<sup>2</sup>, Elizabeth Bonawitz<sup>1</sup>

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Children's ability to infer the speaker's intent has important consequences for learning. For example, when children are asked a pedagogical question (where the asker knows the answer to the question), they show superior learning than when they are asked an information-seeking question (where the asker does not know the answer to the question) (Daubert et al., 2021; Yue et al., 2018). Despite the importance of this issue, however, very little is known about how children infer the intent of the speaker in ambiguous situations. A recent study showed that adults use a specific prosody to mark pedagogical questions that is different from the prosody of information-seeking questions, and adults can differentiate the two types of questions based on prosody (Bascandziev et al., 2021). Here, we ask if children can differentiate pedagogical from information-seeking questions based on prosody. In a pre-registered study, 4-, 5-, and 6-year-olds ( $n=96$ ; 32 per age group; data collection is ongoing for 6-year-olds) received 24 trials in which they heard the same question asked by two individuals, where one question was spoken with pedagogical and the other with information-seeking prosody. Children were asked to guess which of the two individuals is the teacher and knows the answer to the question they asked. The data from 62 4- and 5-year-olds show that while 4-year-olds are performing at chance level, 5-year-olds are performing marginally above chance level ( $p = .05$ ), and 5-year-olds are marginally better than 4-year-olds ( $p = .05$ ). The data collection from 6-year-olds is ongoing.

<https://bcccd.slack.com/archives/C02PSCP8NKW>

**Session 1 [Monday, January 10, 20:30 - 22:00 (UTC +0)]**

**Session 3 [Tuesday, January 11, 13:00 - 14:30 (UTC +0)]**

## **A-0046 Building blocks of cognition: replicating Marcus et al. (1999) and Kovács & Mehler (2009)**

Sybrein Spit<sup>1</sup>, Andreea Geambașu<sup>1</sup>, Daan van Renswoude<sup>1</sup>, Elma Blom<sup>2</sup>, Paula Fikkert<sup>3</sup>, Sabine Hunnius<sup>3</sup>, Caroline Junge<sup>2</sup>, Josje Verhagen<sup>4</sup>, Ingmar Visser<sup>4</sup>, Frank Wijnen<sup>2</sup>, Clara C. Levelt<sup>1</sup>

<sup>1</sup>Leiden University; <sup>2</sup>Utrecht University; <sup>3</sup>Radboud University; <sup>4</sup>University of Amsterdam

We offer close replications of two seminal infant studies, Marcus et al. (1999) and Kovács & Mehler (2009). Marcus et al. (1999) showed that after a brief auditory exposure phase, seven-month-old infants were able to learn and generalize a rule to novel syllables not previously present in the exposure phase. This study was fundamental for the idea that infants are able to form abstract representations and generalize linguistic rules. Kovács & Mehler (2009) showed that seven-month-olds who had been exposed to two languages from birth outperformed monolingual infants in a series of visual switch tasks, suggesting that babies exposed to multiple languages may experience a cognitive boost at an early age.

Across four labs, we conducted exact replications of these two studies. For both experiments, we used the original methodology and stimuli. As in the original studies, we tested the hypotheses that 1) infants are able to learn abstract algebraic rules and apply them to novel input, and 2) that bilingual infants already show a cognitive advantage. We are currently in the final stages of data collection. In this talk we will present results from 96 children for the Marcus et al. replication, and data from 100 to 200 infants for the Kovács & Mehler replication - data collection terminates December 1, or upon reaching this number. This project aims to solidify the results of two seminal studies addressing fundamental questions concerning human cognition.

**<https://bcccd.slack.com/archives/C02PQ4USUM8>**

**Session 1 [Monday, January 10, 20:30 - 22:00 (UTC +0)]**

**Session 5 [Wednesday, January 12, 07:00 - 08:30 (UTC +0)]**

**A-0047 Building action expectations in infants: an fNIRS study**

Tommaso Ghilardi<sup>1</sup>, Iara de Almeida Ivo<sup>1,2</sup>, Marlene Meyer<sup>1</sup>, Jörn M. Horschig<sup>2</sup>, Willy Colier<sup>2</sup>, Sabine Hunnius<sup>1</sup>

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Recent studies show that infants use top-down processes to predict upcoming stimuli and that the fundamental architecture required for expectation-based modulation of the sensory cortex is already in place from an early age. Expectation-based modulation in infants has been explored in the sensory domain, but to date only a few studies investigated if similar processes occur in the motor cortex. In this study, we use functional near-infrared spectroscopy (fNIRS) to examine whether 12-month-old infants' action predictions modulate their sensory-motor cortex. To target top-down processes we used a cross-modal (audio-visuomotor) omission paradigm associating a sound to a video of an action while measuring the infant's hemodynamic response. To account for motion artifacts, we track infants' head motion using two Inertial Measuring Units (IMU). This is especially important since movement artefacts are the number one cause of epoch removal in infancy research with neuroimaging techniques. We will use the IMU-measured head movements to account for the motion effects on the data. We hypothesize that both the motor and visual cortex show significant activation during both stimulus presentation and stimulus omission trials. As no stimulus is presented during the omission trials, such activity would be indicative of top-down processes. Thus, it would reliably determine that infants not only rapidly build sensory prediction, but they also build predictions about actions, and that those predictions are reflected in the activity of the motor cortex. Data collection is almost completed and the results of the analysis will be presented at the conference.

**<https://bcccd.slack.com/archives/C02R5H7H0LA>**

**Session 7 [Wednesday, January 12, 20:30 - 22:00 (UTC +0)]**

**Session 6 [Wednesday, January 12, 13:00 - 14:30 (UTC +0)]**

## **A-0048 Humour may enhance social learning in infants in a tool use learning task**

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Laboratoire Éthologie Cognition Développement (UR LECD), at Paris Nanterre University, Nanterre, France

Humour seems to have positive effects both socially and cognitively. Indeed, it reduces stress, improves social cohesion between individuals and has positive effects on learning in adults. In infants, we conducted a study that investigated the effect of humour on learning in a social learning context and showed that at 18 months of age, 94% of infants who laughed during a humorous demonstration of a tool use, reproduced the target action compared to only 30% of infants who did not laugh or when the demonstration was not humorous. The aim of the current study was twofold: (1) replicate this previous study with a large age range and (2) examine the age at which the understanding of humour appears during development, given that some authors consider that infants perceive humour as early as their first laughter around 5 months, while others argue that humour appears as soon as infants display pretend play behaviours around 18 months. In order to test these questions, we repeated our previous study with 70 infants aged between 14 to 22 months, in addition to a pretend play test. Our preliminary results suggest that the perception of humour appears around 18 months of age but does not seem to be correlated with pretend play. In addition, infants seem to learn better when they are exposed to a humorous demonstration regardless of whether they laugh or not. These results raise questions about the possible factors involved in humour and can explain the effect observed, namely incongruity and surprise.

**<https://bcccd.slack.com/archives/C02PQ5V8LNP>**

**Session 7 [Wednesday, January 12, 20:30 - 22:00 (UTC +0)]**

**Session 12 [Friday, January 14, 13:00 - 14:30 (UTC +0)]**

## **A-0050 Affective and semantic incongruency of occupational labels have disparate effects in supra- and subthreshold face recognition tasks**

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Institute of Psychology, University of Pécs, Hungary

Recognition accuracy of faces can be enhanced by stimulating a specific part of the face-space. This can happen with labels suggesting social status, occupation, or typical behavior. The effect might be ascribed either to semantic information playing a role in recollection of memories, affective information evoked by the labels, or both.

We designed two studies in which participants learned associations between faces and occupational labels. In Study 1, subjects were exposed to faces, preceded by labels for 2000ms. In Study 2, they were primed with labels for 33ms. Faces appeared after either the learned labels, or after incorrectly paired labels, intertwined with unfamiliar faces. In the incongruent conditions the semantic and affective distances between the presented and the correct labels varied. The task was to respond to those faces they have encountered in the learning phase.

Subjects responded slower to incongruent stimuli in both studies. This confirms the assumption that false labels activate a specific region of the face-space, which puts a cognitive load on recognition. In Study 1, the joint difference of semantic and affective contents had the largest effect. In Study 2, in contrast, reaction time was mostly influenced by the affective distance, semantic difference did not have significant effect on face recognition speed.

To conclude, semantic information has a strong effect when it is consciously evaluated because it is mapped onto a smaller region of face-space and provides more accurate information. However, the processing of emotions evoked by a label might be quicker and precede conscious responses.

**<https://bcccd.slack.com/archives/C02PHDX5W4W>**

**Session 4 [Tuesday, January 11, 20:30 - 22:00 (UTC +0)]**

**Session 3 [Tuesday, January 11, 13:00 - 14:30 (UTC +0)]**

## **A-0051 Visual category learning in neurotypical and ASD children**

Eszter Dóra Szabó<sup>1,2</sup>, Anett Ragó<sup>2</sup>

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Dual models argue for separate systems behind category learning: an implicit and a verbal learning process. Because of the late maturation of the frontal lobe, the implicit system dominates at kindergarten's age, so they should acquire information-integration tasks easily. Children with ASD are known to have detail-oriented perception making it harder for them to form prototypes while learning categories. Our goal was to measure whether children with high-functioning ASD abstract prototypes or they rely on exemplar memory solving this task.

Using an information-integration task 10 children age of 6-13 participated in a four-session training where they got familiar with far-from-prototype exemplars of two categories according to a complex family resemblance structure. In test phase they had to create an exemplar of each category with features given to them.

Our finding is that children with high-functioning ASD do not perform better than chance level while in our previous studies neurotypical preschool age children (3-5 years) performed better and showed signs of category learning and using this knowledge.

**<https://bcccd.slack.com/archives/C02PQ4YEPT4>**

**Session 10 [Thursday, January 13, 20:30 - 22:00 (UTC +0)]**

**Session 11 [Friday, January 14, 07:00 - 08:30 (UTC +0)]**

## A-0052 Perspectives on perspective taking

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In level-1 perspective taking (L1PT) the question is which objects in a scene someone else can see and which ones they can not. Level-2 perspective-taking (L2PT) is assessing how certain objects appear to an agent. Regarding L1PT and L2PT, two-system views assume that L1PT does not, whereas L2PT does require metarepresentation. While L1PT seems automatic, and is subject to altercentric intrusion, L2PT appears cognitively more demanding. A variety of nativism, on the contrary claims that both types involve metarepresentation, and the real difference between them lies in the performance load imposed by the different tasks. A third possible view, however, is that neither L1PT nor L2PT, in its present form, requires metarepresentation. Current L2PT tasks typically assign different viewing angles to different agents. Moreover, just as L1PT may rely on a spatial relation between object and agent, assessing the vantage point of an agent (hence how an object looks to them) may rely on which side of an object faces the agent's eye. What really does take metarepresentation is, for example, assessing whether someone else experiences the same visual illusion as one does. This view may indeed be too extreme as sensitivity to blindfolding itself indicates that some notion of seeing is being exercised by the subject, beyond merely assessing spatial relations. Still, L2PT, that is, vantage-point-difference tasks may also be simplified so that they need minimal working memory load. We propose to discuss whether these observations support hard-nosed nativism, or some form of a more austere view.

<https://bcccd.slack.com/archives/C02PQ4Z0ZM0>

**Session 5 [Wednesday, January 12, 07:00 - 08:30 (UTC +0)]**

**Session 3 [Tuesday, January 11, 13:00 - 14:30 (UTC +0)]**

## **A-0054 Does familiarity matter in children's attributions of stability to others' knowledge and preference states?**

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Young children show an understanding that knowledge and preference states might vary across situations and across people (e.g., Atance & Caza, 2018; Belangar et al., 2014). In two studies we investigated children's attribution of stability to others' knowledge and preference states across age and location and whether these attributions change as a function of children's familiarity with the items people like or know.

We tested a total of 165 children online (86 4-year-olds, 79 6-year-olds), who were randomly assigned to knowledge or preference conditions. Children were introduced to characters who knew or liked a song, a story, a game and a dance, that were either novel (Study 1) or familiar (Study 2). Children were asked whether the characters would still know/like these when they move to another city or when they grow-up to be an adult.

A mixed ANOVA with Familiarity, Age and Condition as between-subjects and Inference (location vs. age) as within-subjects variables showed an effect of inference; children expected more stability across location than across age ( $p < .001$ ). There was also a Familiarity and Age interaction,  $p < .05$ ; for familiar items, 6-year-olds expected more stability than 4-year-olds,  $p < .01$ . Chance comparisons revealed that children expected knowledge and preference to be stable across location for both familiar and novel items ( $ps < .05$ ). When predicting stability across age, however, only 4-year-olds expected preference to be stable for novel items ( $p < .001$ ), while only 6-year-olds expected knowledge to be stable for familiar items ( $p < .001$ ).

<https://bcccd.slack.com/archives/C02P9FNDL87>

**Session 2 [Tuesday, January 11, 07:00 - 08:30 (UTC +0)]**

**Session 3 [Tuesday, January 11, 13:00 - 14:30 (UTC +0)]**



## **A-0055 Investigating the influence of cultural group membership on preschoolers' long term learning**

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In our study, we investigate whether the long term retention of novel information is influenced by the cultural group membership of a demonstrator. Upon arriving at the lab, the 4 year old participants are acquainted with an experimenter, who accompanies them to the testing room, and leaves for a brief period of time. In her absence, another experimenter enters whom the children witness either speaking their native language (Hungarian) or a different one (French). Following this, children see the model attaining three goals during three short events; in all cases, with the help of a target object and a supplementary object which is always hidden in one of two possible locations. Children are reinvented to the lab a week later, and the first experimenter allows them to play with the object sets previously shown to them, one by one. We measure how accurately participants recreate the events demonstrated to them. The prediction is that after one week's delay, children will more accurately recall the previously demonstrated events in case it was presented to them by an in-group model, compared to an out-group model. Data collection is still ongoing. We have finished the pilot phase of the experiment (n = 12), during which children were allowed to play with the object sets without the delay period. Based on the data, the task is suitable for the age group and there seems to be no difference in the imitation score (average after in-group = 8,4; average after out-group = 8,57).

**<https://bcccd.slack.com/archives/C02PQ5QV8RZ>**

**Session 10 [Thursday, January 13, 20:30 - 22:00 (UTC +0)]**

**Session 6 [Wednesday, January 12, 13:00 - 14:30 (UTC +0)]**

## **A-0056 How to grow a self: development of self-representation in the Bayesian brain**

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Mateusz Woźniak<sup>1,2</sup>

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The last two decades saw multiple attempts to explain how the self is represented in the brain within the framework of the Bayesian brain, typically within the framework of predictive coding. However, these attempts largely focused on describing a developed, adult self-representation. The current paper argues that looking at the developmental trajectory is crucial for understanding the structure of self-representation. It argues that emergence of the self should be understood as an instance of the process of acquisition of new internal models of hidden causes of sensory input. The paper proposes how such models emerge and develop over the course of life by looking at different stages of development of bodily and extra-bodily self-representations. It argues that the self arises gradually in a series of discrete steps: from first-person multisensory representations of one's body to third-person multisensory body representation, and from basic forms of the extended and social selves to progressively more complex forms of abstract self-representation. It discusses how each of them might emerge based on domain-general learning mechanisms, while also taking into account the potential role of innate representations.

**<https://bcccd.slack.com/archives/C02P9FNFPBR>**

**Session 8 [Thursday, January 13, 07:00 - 08:30 (UTC +0)]**

**Session 6 [Wednesday, January 12, 13:00 - 14:30 (UTC +0)]**

## **A-0057 Cross-cultural differences in inter-personal trust among children: Comparing Turkey and Sweden**

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Trust is considered essential for societies to function (Rotter, 1971). However, there is considerable variability in individuals' trust levels across cultures. Turkey ranks among the lowest countries in terms of interpersonal trust rates (i.e., to believe that most people can be trusted), while Sweden ranks among the highest (Delhey & Newton, 2005). Here, we examine whether these differences are already observed in childhood.

We tested 7–10-year-old children in Turkey (N = 107) and in Sweden (N = 70, ongoing). Participants were introduced to four targets that represent (1) their parent, (2) their best friend, (3) an unfamiliar in-group member (Turkish or Swedish), and (4) an unfamiliar out-group member (a novel nationality). Children were presented with 24 hypothetical scenarios (6 per target) and they rated how much they would trust each target using a scale from 1-5.

A mixed ANOVA with Familiarity (Parent, Best Friend, In-group, Out-group) as the within-subject variable and Nationality (Turkish, Swedish) as the between-subjects variable revealed an effect of Familiarity ( $p < .001$ ): Children trusted familiar targets more than unfamiliar targets. Further, we observed an effect of Nationality ( $p = .030$ ): Overall, trust ratings were higher in Turkey compared to Sweden. We also found an interaction between Familiarity and Nationality ( $p = .037$ ): Children in Sweden exhibited similar trust levels for unfamiliar targets ( $p > .9$ ), whereas children in Turkey exhibited lower trust for out-groups compared to in-groups ( $p = .027$ ). Thus, some cross-cultural differences in inter-personal trust are already evident in childhood.

<https://bcccd.slack.com/archives/C02QDS2A7S4>

**Session 2 [Tuesday, January 11, 07:00 - 08:30 (UTC +0)]**

**Session 12 [Friday, January 14, 13:00 - 14:30 (UTC +0)]**

## **A-0058 Children's intuitions about the sources of moral and social-conventional norms**

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Boğaziçi University, İstanbul, Turkey

Children consider moral norms as universal and unchangeable, while social norms as context-dependent and specific to certain groups (Josephs & Rakoczy, 2016; Schmidt, Rakoczy, & Tomasello, 2012). This study explores whether children's intuitions about how they have acquired these norms also differ.

We tested 41 5-year-olds (Range = 5.06 to 6.17 years, SD = .25) and 41 8-year-olds (Range = 8.04 to 8.98 years, SD = .25). Children were presented with a moral or social norm and asked whether they were familiar with it. If they were familiar with the norm, they were asked whether they learned the norm on their own or from another person. Finally, children were asked to elaborate on the source with open-ended questions (e.g., how they learned about the norm, who the source was, etc.). These answers were then coded into several source categories.

A mixed ANOVA with Norm Type and Age on the ratio of choosing self as the source revealed a significant interaction between Norm Type and Age ( $F(1, 77) = 5.22, p = .03$ ): 5-year-olds reported to have learned social norms by themselves ( $M = .56, SD = .39$ ), more than 8-year-olds did ( $M = .34, SD = .32$ ). Further planned analyses revealed distinct distributions in terms of the frequency of the sources reported for different norm types ( $\chi^2(42, N = 82) = 65.47, p = .012$ ). The details of these distributions and their implications will be discussed.

<https://bcccd.slack.com/archives/C02PQ4WPMC2>

**Session 2 [Tuesday, January 11, 07:00 - 08:30 (UTC +0)]**

**Session 3 [Tuesday, January 11, 13:00 - 14:30 (UTC +0)]**

## **A-0059 Do I need reward or control? Action selection, motor planning and control in children with ADHD.**

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Human development is not a passive process of being exposed to environmental stimuli, but rather an active learning whereby children gradually refine their ability to make choices. Action selection entails multifaceted mechanisms that are frequently affected by neurodevelopmental disorders such as Attention Deficit Hyperactivity Disorder (ADHD). The extant literature indicates that children with ADHD have atypical reward sensitivity and impaired cognitive and motor planning and control. On the other hand, recent accounts of action selection suggest that individuals perform actions even regardless of the outcome valence (i.e., reward or punishment). The mere fact of doing something that produces an effect on the external world makes us feel we have control over the consequences of our actions, which is motivating per se. This sense of agency arises from learning the action-effect correspondence, which is based on statistical learning. As little is known about these mechanisms in ADHD, the present research aims at shedding light on the interconnected roles of motor planning and control, sensitivity to reward and sense of agency for action selection. We employed a behavioural and kinematic paradigm to explore action selection strategies in a cohort of children (6-15 years old) with ADHD and neurotypical controls. We asked participants to reach and select one of the alternative response keys, thus manipulating the keys' probability of delivering a neutral or positive effect. We measured frequency of responses and kinematics (i.e., reaction time, movement duration, percent time to peak velocity). Preliminary results, open considerations and future directions are presented.

<https://bcccd.slack.com/archives/C02PSCQ8T7E>

**Session 1 [Monday, January 10, 20:30 - 22:00 (UTC +0)]**

**Session 11 [Friday, January 14, 07:00 - 08:30 (UTC +0)]**

## **A-0060 Positive maternal affect – but not dialogic reading style – correlates with toddlers’ language skills**

Janna Maria Völker, Christina Rosner, Nicole Altvater-Mackensen  
Johannes-Gutenberg-Universität Mainz, Mainz, Germany

Reading picture books with toddlers is a common activity providing rich cues for language learning and fostering language development (O’Farrelly et al., 2018; Reese, 2019). Yet, most of the research on shared book reading is carried out with pre-schoolers. Against this background, the current study explores individual differences in parental reading style and their influence on early language development in 18- to 24-month-old toddlers.

We recorded mother-child dyads during shared book reading. Dialogic (Whitehurst et al., 1988), affective (Sonnenschein & Munsterman, 2002) and instructional quality (Bingham, 2007) of maternal reading was coded as well as quantity and complexity of maternal speech. We further coded infants’ enthusiasm and attention during reading (Frosch et al., 2001). Qualitative and quantitative aspects of shared reading were additionally assessed in a questionnaire administered to mothers. Outcomes of a standardized language test (Szagun et al., 2009) served as dependent measure.

Preliminary analysis indicates selective positive effects of affective reading quality ( $r(12) = .625, p = .05$ ) on language development, suggesting that emotional affect might be a better predictor of language outcomes than dialogic or instructional reading in young children with limited linguistic abilities. Interestingly, self-reported and observational measures of reading quality only marginally correlated, highlighting the potential confound of social expectations in questionnaire data. language development - toddler - parental reading style - dialogic reading - emotional affect

**<https://bcccd.slack.com/archives/C02PQ5SN2BD>**

**Session 4 [Tuesday, January 11, 20:30 - 22:00 (UTC +0)]**

**Session 12 [Friday, January 14, 13:00 - 14:30 (UTC +0)]**

## **A-0062 Effects of bilingualism and executive functions on verbal creativity in preschool children**

Pınar Karataş<sup>1</sup>, Belkıs Sayın<sup>2</sup>, Simge Sarıççek<sup>1</sup>, Karla Tüzütürk<sup>1</sup>, Aslı Aktan-Erciyes<sup>1</sup>

<sup>1</sup>Kadir Has University, Istanbul, Turkey; <sup>2</sup>Boğaziçi University, Istanbul, Turkey

Previous research demonstrated positive relationship between bilingualism and creativity (e.g., Madhav and Anand, 2012). Verbal creativity refers to generating original, novel, and flexible narrations. Some findings indicated that monolinguals are better at verbal-creativity tasks due to the better L1 (e.g., Kharkhurin, 2010), others show bilingual advantage on verbal creativity (e.g., Sampedro & Peña, 2019). Present study investigates how being bilingual affects verbal creativity of preschool children, controlling L2-proficiency, socioeconomic-status, and EFs.

Fifty-six 5-to-6-year-old (Mage=65.5 months, SD=7.8) L1-Turkish L2-English-speaking children participated in the study. We administered Backward-Digit-Span, Dimensional-Change-Cart-Sort, and Story-Completion, Bear-Dragon tasks to measure working-memory, cognitive-flexibility, inhibitory-control, and verbal-creativity. Participants were assessed on their L1-Turkish and L2-English. Children were categorized into two groups depending on their L2-proficiency, (i.e., high-bilinguals vs. low-bilinguals). We predicted that being high-bilingual and having better EFs would be positively associated with verbal creativity.

We performed hierarchical linear regression analysis, taking verbal-creativity score as an outcome variable and SES, EFs, and bilingual group and L1-proficiency as predictor variables. The results indicated that being high-bilingual ( $\beta=.3$ ) and having lower working-memory ( $\beta=.07$ ) L1-proficiency ( $\beta=.01$ ) is associated with higher verbal creativity ( $R^2=.29$ ,  $p's<.05$ ). Cognitive-flexibility, inhibitory-control, and SES were not associated with verbal-creativity ( $p's>.05$ ). Findings indicate that high-bilingualism, L1-proficiency, and lower working-memory are associated with better verbal-creativity performance. L1-proficiency and high-bilingualism would promote performance in verbal-creativity due to the advanced use of language (Kharkhurin, 2010), and enriched linguistic skills (Lee and Kim, 2013). Unexpectedly, lower working-memory-capacity was associated with lower verbal-creativity, which might be a specific consequence of L2-schooling on the performance of Digit-Span.

<https://bcccd.slack.com/archives/C02QDS3338Q>

**Session 11 [Friday, January 14, 07:00 - 08:30 (UTC +0)]**

**Session 3 [Tuesday, January 11, 13:00 - 14:30 (UTC +0)]**

## **A-0063 The Role of Meta-representation beyond the Scope of Theory of Mind: Children's Development of Mental Time Travel and Modal Reasoning Abilities**

Lydia Paulin Schidelko<sup>1</sup>, Leonie Baumann<sup>1</sup>, Marlene Meyer<sup>1</sup>, Marina Proft<sup>1</sup>, Hannes Rakoczy<sup>1</sup>, Jan Engelmann<sup>2</sup>

<sup>1</sup>University of Göttingen, Germany; <sup>2</sup>University of California, Berkeley

The developmental transition children undergo around age 4 when they come to master verbal false belief (FB) tasks is considered to mark the onset of a meta-representational Theory of Mind (Perner, 1991). Success in FB tasks goes along with emerging competence in conceptually related tasks (e.g., false sign tasks, identity tasks) that all require meta-representational perspective taking (e.g., Perner et al., 2002, 2003). The present studies aim to elucidate the development of meta-representation more generally and to test claims that growing meta-representation underlies both mental time-travel and modal reasoning (Carey et al., 2020; Redshaw & Suddendorf, 2020).

In the first study, we compare 3- to 8-year-old children's (N=120) developing meta-representation in recursive Theory of Mind with their recursive mental time travel abilities on three levels of recursion. Theory of Mind was operationalized as first-, second-, and third-order FB understanding and mental time travel as an understanding of future possibilities (first order), counterfactual thinking (second order) and anticipated counterfactual thinking (third order mental time travel).

The second study compares three-, four- and five-year-old's (N= 90) meta-representational FB understanding with their ability to hold modality representations in two different tasks: adaptations of the Y-tube task (Redshaw & Suddendorf, 2016) and partial ignorance task (Kloo et al., 2017).

Data collection for the two preregistered studies (<https://aspredicted.org/gk6ai.pdf>, <https://aspredicted.org/ds5tn.pdf>) is ongoing but will be completed by January, 2022. The results will be discussed with regard to their implications for thinking about the scope of meta-representation in cognitive development more generally (Carey et al., 2020).

**<https://bcccd.slack.com/archives/C02PHDQAMPY>**

**Session 7 [Wednesday, January 12,20:30 - 22:00 (UTC +0)]**

**Session 11 [Friday, January 14,07:00 - 08:30 (UTC +0)]**



## **A-0064 The Influence of Facial Masks on Children’s Social and Emotional Development**

Lea Moersdorf, Stephanie Wermelinger, Moritz M. Daum

University of Zurich

The COVID-19 pandemic has dramatically changed people’s social lives. Children face situations in which their caregivers are required to wear facial masks. Parents and media reports likewise debate the question of whether and how wearing masks impacts children’s social and emotional development. So far, empirical evidence is insufficient to answer this question. In this project, we investigate infants’ and children’s development of three important abilities, namely gaze following, joint attention, and emotion recognition, and how they are influenced by the increased time children interact with individuals wearing facial masks.

In Study 1 (within- and between-subjects design), we test 12- to 15-month-olds’ gaze following before and after the COVID-19 pandemic and joint attention when their caregiver does vs. does not wear a facial mask. In Study 2 (between-subjects design), we test 4.5- to 5.5-year-old children’s emotion recognition currently (during the COVID-19 pandemic) and compare it to data of other children recorded before the COVID-19 pandemic.

Data collection is still ongoing and will be finished in October 2021. Preliminary analyses of a subsample of n = 50 kindergarteners suggest that children’s emotion recognition generally decreased after the COVID-19 pandemic, but that this decrease depends on the emotion tested. With this project, we aim to contribute to the current debate on the influence of the pandemic on the development of children and assist stakeholders in informed decision making.

<https://bcccd.slack.com/archives/C02Q2PC9K5X>

**Session 1 [Monday, January 10, 20:30 - 22:00 (UTC +0)]**

**Session 3 [Tuesday, January 11, 13:00 - 14:30 (UTC +0)]**

## **A-0065 Children's early understanding of pretend emotions**

Francesc Sidera<sup>1</sup>, José Miguel Ramos<sup>1</sup>, Georgina Perpiñà<sup>1</sup>, Clara Andrés-Roqueta<sup>2</sup>, Elisabet Serrat<sup>1</sup>

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The study by Walle & Campos (2014) suggested that young children are capable of detecting inauthentic emotional communication and respond accordingly. The present study aims to further study young children's implicit understanding of pretend emotions for different emotional expressions. With this purpose, a total of 46 mother-child pairs participated in the study. Children were from 18 and 31 months of age. Different situations were designed to study the early understanding of pretend emotions. In each situation the mother was asked to express an emotion (sadness, fear and anger) within a certain context either for playing with the child (pretend condition) or for deceiving them (real emotion). Hence, a total of 6 situations (3 emotions x 2 conditions) were analyzed. The expression of the mother and the response of the child were videorecorded, and their emotional expression and behavior were analyzed through a coding system. Children older than 2 years displayed more positive emotions in the pretend condition compared to the real condition for the emotions of sadness and anger (not for fear). This indicates that from this age children implicitly understand the playful communicative intentions of their mothers when they express certain negative pretend emotions, while still having some difficulty in understanding pretend fear.

Walle, E. A., & Campos, J. J. (2014). The Development of Infant Detection of Inauthentic Emotion. *Emotion*, 14(3), 488-503.

**<https://bcccd.slack.com/archives/C02QDS0L7GQ>**

**Session 1 [Monday, January 10, 20:30 - 22:00 (UTC +0)]**

**Session 8 [Thursday, January 13, 07:00 - 08:30 (UTC +0)]**

**A-0066 The spatial representation of serial order in infancy**Roberta Bettoni<sup>1,2</sup>, Luca Rinaldi<sup>3</sup>, Martina Arioli<sup>1,2</sup>, Hermann Bulf<sup>1,2</sup>, Viola Macchi Cassia<sup>1,2</sup><sup>1</sup>University of Milano-Bicocca, Italy; <sup>2</sup>Center of Neurosciences (Neuro-MI), Milan, Italy; <sup>3</sup>University of Pavia, Pavia, Italy

When Western adults/children remember sequences of ordered items, they spontaneously generate an internal spatial template, where items are mapped on a horizontal continuum oriented according to their reading-writing habits (i.e., left-to-right). A critical question then arises as to whether the association between order and space in working memory (WM) emerges even before the acquisition of reading/writing skills. Here, we investigated whether 6-month-old infants spatially organize visual sequences in WM, and whether this is related to exposure to culturally driven directional routines in their environment. Infants (N=22) were first habituated to sequences of four shapes appearing centrally on the screen, then viewed two test trials in which the first or the last item of the sequence was presented bilaterally, and two post-test trials in which the familiar sequence was presented in alternation with a novel sequence (i.e., where the familiar shapes appeared in a novel order). Orienting responses toward the left versus right side at test and looking times to the familiar versus novel order at post-test were measured as dependent variables. Spontaneous directional behaviors produced by the caregivers were also measured during two sessions of joint reading and toy construction. Results showed that infants oriented more frequently to the left versus the right when the first item was bilaterally presented, suggesting that they perceived the association first-left as more salient than the association first-right. The magnitude of this preference was associated with the frequency of caregiver's directional behaviors, suggesting that informal learning experience may contribute to shape order-space associations.

<https://bcccd.slack.com/archives/C02PM6S34MB>

**Session 4 [Tuesday, January 11, 20:30 - 22:00 (UTC +0)]**

**Session 8 [Thursday, January 13, 07:00 - 08:30 (UTC +0)]**

**A-0067 Mirror self-recognition in ni-Vanuatu toddlers**

Ljubica Petrovic, Senay Cebioglu

Max Planck Institute for Evolutionary Anthropology, Leipzig, Germany

Children's first recognition of their face in the mirror indicates the emergence of objective self-awareness, the ability to think about oneself. Among Western urban samples, 18 months marks the onset of this ability and the majority of infants pass the mirror self-recognition (MSR) test by 24 months (Lewis & Brooks-Gunn, 1979). Studies conducted with non-Western rural samples, however, show that passing rates are significantly lower in this age group. Currently, the developmental trajectory of self-recognition in populations outside of the Western urban context is unknown. In the present study, we tested a broader age range of ni-Vanuatu children in order to describe the developmental trends of MSR within this population. Data was collected from 65 toddlers aged 17 - 36 months (25 female) in Tanna island, Vanuatu. Based on recommendations from previous research, participants were familiarised with the mirror prior to testing, trained to remove the mark from a doll's and their own body, and they received several prompts to remove the mark during the test. Additionally, an alternative self-recognition task (i.e., leg recognition; Nielsen et al., 2016) that generates equivalent performance among Western toddlers was administered. Preliminary results suggest that ni-Vanuatu toddlers are not passing the classic face-recognition test prior to 24 months and that performance stabilizes around over 30 months. Our poster will present MSR passing rates for various age groups, compare performance on the face- and leg-recognition tests, and discuss implications for the ecological validity of the MSR test.

**<https://bcccd.slack.com/archives/C02PQ5R9K9R>**

**Session 2 [Tuesday, January 11, 07:00 - 08:30 (UTC +0)]**

**Session 9 [Thursday, January 13, 13:00 - 14:30 (UTC +0)]**

## **A-0068 Can an Adult's Non-Verbal Behaviour Increase Young Children's Commitment in Joint Action?**

Melissa Perring<sup>1</sup>, Sotaro Kita<sup>1</sup>, John Michael<sup>2</sup>, Barbora Sipošová<sup>1</sup>

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When adults coordinate together in a task, they seem more committed and more likely to complete the task together. But can an adult coordinating with a young child increase the child's sense of commitment within a joint activity? This study investigated whether coordination in a joint activity – with or without ostensive cues – elicited commitment-related behaviour: persistence and acknowledgement behaviour. In a between-subjects design with three conditions (N=72), we compared 4-year-olds responses when their adult play partner used: A) low coordination; B) high coordination; or C) high coordination with ostensive cues. Results failed to support the 'coordination creates commitment' hypothesis: children were no more persistent in the high coordination with ostensive cues condition, than the low coordination condition, and were, surprisingly, less likely to show acknowledgement behaviours on leaving. Rather than inferring that high coordination with ostensive cues reduced children's commitment, we provide a new interpretation of earlier findings. Firstly, we reinterpret "acknowledgment behaviours" to indicate that children were seeking rather than giving information – i.e., they were not acknowledging leaving the main game but were checking with their joint activity partner to see whether it was okay to leave. Secondly, we conclude that high coordination with ostensive cues served to disambiguate the conflict situation for the child by bringing them closer to the experimenter and the experimenter's thoughts. This enabled them to better predict the experimenter's response to them leaving the game and made the need for checking less likely.

<https://bcccd.slack.com/archives/C02PQ4V3YQJ>

**Session 1 [Monday, January 10, 20:30 - 22:00 (UTC +0)]**

**Session 12 [Friday, January 14, 13:00 - 14:30 (UTC +0)]**

## **A-0069 Objective assessment of visual attention in toddlerhood**

E. K. Braithwaite<sup>1</sup>, V. Kyriakopoulou<sup>2</sup>, A. Davidson<sup>2</sup>, N. Tumor<sup>2</sup>, N. Harper<sup>2</sup>, M. Earl<sup>2</sup>, S. Datto-Partridge<sup>2</sup>, A. Chew<sup>2</sup>, S. Falconer<sup>2</sup>, L. Mason<sup>1</sup>, M.H. Johnson<sup>3</sup>, C. Nosarti<sup>2</sup>, A.D. Edwards<sup>2</sup>, E.J.H. Jones,<sup>1</sup>

<sup>1</sup>Birkbeck, University of London; <sup>2</sup>Kings College London; <sup>3</sup>University of Cambridge

Visual attention is an important mechanism through which children learn about their environment, and individual differences could substantially shape later development. Eye-tracking allows us to objectively assess visual attention with high temporal and spatial fidelity, making it a suitable measure of development for large-scale studies. However, most eye-tracking studies of visual attention use study-specific experiments in small groups of infants. This approach makes it challenging to assess the generalisation of results across samples, and to pool data. Here we investigate the feasibility of a comprehensive assessment of visual attention that includes measures of working memory, visual search, orienting speed, reversal learning, and spontaneous attention to faces. We present data from 350 (163 females) term-born 18-month-olds recruited as neonates (<http://www.developingconnectome.org/>). We examined the percentage of valid data obtained, how metrics varied with data quality, and whether expected profiles of task performance were elicited. We then used structural equation modelling to characterise the interrelationship between performance on key task measures. Analyses showed the expected condition effects for seven out of eight tasks (p-values ranged from <.001 to .04) and that quality and quantity of data collected was generally high. Consistent with theoretical models of visual attention, performance could be explained by four latent factors representing social attention, exogenous orienting, memory-guided choice and search; the fit of the model was good: RMSEA=0.044 (CI=0.035-0.052, p=.90); CFI=0.933; TLI=0.906;  $\chi^2(196)=326.66$ ,  $p<0.001$ ,  $\chi^2/df=1.67$ . In summary, comprehensive eye-tracking batteries can be used on a large scale to objectively measure core components of visual attention in toddlerhood.

<https://bcccd.slack.com/archives/C02Q2P9L3U1>

**Session 1 [Monday, January 10, 20:30 - 22:00 (UTC +0)]**

**Session 6 [Wednesday, January 12, 13:00 - 14:30 (UTC +0)]**

## **A-0070 Changing Status: The Effect of Relative Status on Children's Monopolizing Behavior.**

Chana Berelejjs, Avi Benozio

Hebrew University, Jerusalem, Israel

Humans' socio-cognitive capabilities evolved within contexts wherein monitoring oneself and others is key. Specifically, "high social status" is often a synonym for having higher access to resources. Research with adults demonstrates sensitivity to status-related cues, the behavioural paths taken to enhance status, and sex differences in the willingness to compete for higher status. However, developmental research on this topic is scarce. We know that infants are responsive to status-related cues (Thomsen, 2020), and 3-6-year-olds hold specific expectations from high-status individuals (Stavans & Diesendruck, 2020). We do not know how children conduct their behaviour with a peer of lower-, equal-, or higher status.

Two preregistered studies have addressed children's willingness to monopolize resources in a Dictator-game 'Taking' task. In Study 1, 195 4-7-year-olds played a competitive game with an unfamiliar peer and were randomly assigned to a Winning or Losing condition (High or Low-Status, respectively). Then, a second game followed in which children could take resources from a new peer of lower, equal, or higher status than theirs. We found that children did not monopolize resources from lower-status peers and took ~50% of the endowment but monopolized resources from higher-status peers (~70%). Interestingly, a gendered-behavior was revealed towards equal-status peers – girls were egalitarian, whereas boys monopolized resources. Study 2 (N=101) involved a non-social phase (Succeeding/Failing instead of Winning/Losing) and excluded the possibility that children's actions reflect emotional responses.

By addressing relative status in dyads, these studies expose sex differences and similarities which will be discussed from evolutionary, cultural, and developmental perspectives.

<https://bcccd.slack.com/archives/C02P9FQQJQP>

**Session 5 [Wednesday, January 12, 07:00 - 08:30 (UTC +0)]**

**Session 9 [Thursday, January 13, 13:00 - 14:30 (UTC +0)]**

## **A-0071 Children's Understanding of the Normativity of Schadenfreude**

Bianca Dietrich<sup>1,2</sup>, Helena Petersen<sup>1</sup>, Marco F. H. Schmidt<sup>2</sup>

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Schadenfreude (i.e., malicious joy) describes the experience of pleasure deriving from others' misfortune (Heider, 1958). Previous research showed that already young children can express and attribute schadenfreude to others (e.g., Schulz et al., 2013; Shamay-Tsoory et al., 2014), but so far, no study has investigated children's understanding of the normative dimension of schadenfreude. While schadenfreude is generally considered improper when expressed about a person's failure to achieve their (morally neutral or praiseworthy) goal, it might be considered justified (and collectively accepted) when expressed about a person's failure to achieve their morally reprehensible goal. Thus, we examine preschoolers' normative judgement and evaluation of others' expression of schadenfreude about a third person's failure to accomplish different morally relevant goals. In a target task with two picture stories, different individuals perform actions with either the goal to help (good intention) or to harm (bad intention) another agent. In both conditions, children observe the individuals failing to accomplish their goals and another character expressing happiness (i.e., schadenfreude) about the failure. At the end of each story, children are asked to judge whether the expression of happiness is (morally) good or bad (forced choice) and to evaluate how good or bad it is (Likert scale). Preliminary results of 44 older preschoolers suggest that 5- to 6-year-olds do understand the normative dimension of schadenfreude. Seventy-eight percent stated that the character's expression of happiness in the bad intention condition is good, while 100% stated that the character's expression of happiness in the good intention condition is bad.

<https://bcccd.slack.com/archives/C02Q2PAA82D>

**Session 7 [Wednesday, January 12, 20:30 - 22:00 (UTC +0)]**

**Session 12 [Friday, January 14, 13:00 - 14:30 (UTC +0)]**



## **A-0072 Does face familiarity impact audio-visual association? Matching isolated vowels with own- and other-race faces in 3- and 9-month-old infants.**

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Face and language processing show intriguing links during development (Pascalis et al., 2014). Newborns initially demonstrate universal perception abilities and become gradually attuned to the languages and the faces they are the most exposed to (Eimas et al., 1971 Nelson, 2001, Kelly et al., 2007). We previously demonstrated that after nine-months, recognition of own- and other-race individuals was impacted by the language they were associated with (de Boisferon et al., 2020; Clerc et al., 2021). Hence, the development of the sensitivity to own- vs. other-race faces could affect language learning processes.

One essential skill for language learning is to be able to exploit speech multimodally. Patterson & Werker (1999, 2003) showed that speech is represented inter-modally as early as two months of age. The goal of the study was to test whether this rudimentary audiovisual matching skill is sensitive to the race of faces that produces the speech signal. We tested three- and nine-month-old Caucasian French-learning infants in a similar task, using either own- and other-race faces. Infants were presented with two simultaneously displayed talking faces of the same female speaker (one side producing [i], the other [u]) with a synchronous vowel sound (audio /i/ or /u/).

Preliminary results show that three-month-olds look longer at the matching face in the own-race condition ( $p = 0.017$ ;  $N = 27$ ) but not in the other-race condition ( $p = 0.984$ ;  $N = 22$ ). Face familiarity could impact how infants learn to exploit multimodal speech cues as soon as 3 months.

**<https://bcccd.slack.com/archives/C02PSCPAYQL>**

**Session 10 [Thursday, January 13, 20:30 - 22:00 (UTC +0)]**

**Session 12 [Friday, January 14, 13:00 - 14:30 (UTC +0)]**

## **A-0073 Fast Periodic Visual Stimulation (FPVS): A powerful tool for developmental cognitive neuroscience**

Stefanie Peykarjou<sup>1</sup>, Stefanie Hoehl<sup>2</sup>, Bruno Rossion<sup>3,4</sup>, Sabina Pauen<sup>1</sup>

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In Fast Periodic Visual Stimulation (FPVS), visual stimuli are presented at a fixed rate while recording electroencephalographic (EEG) responses on the scalp to measure synchronization of brain responses with the stimulation. This approach has emerged as a powerful tool in cognitive neuroscience during the last decade and is increasingly applied with developmental populations (e.g., De Heering & Rossion, 2015; Lochy et al., 2020; Peykarjou et al., 2017) to tackle issues in cognitive development. It provides unique opportunities for research across ages as it can be applied using similar stimulation and the same dependent measures at all ages. Still, research with infants poses challenges that require consideration and adaptations of analyses. These challenges include limits to attentional capacity, variation in looking times, and presence of artefacts in the EEG signal.

This presentation will provide an overview over current evidence on face individuation (N = 39 subjects in 2 groups) and categorization of familiar (N = 141 across three age-groups) and unfamiliar (N = 95 infants across 4 conditions) object categories. In short, evidence indicates that infants a) show an individuation response for familiar and unfamiliar faces by five months of age, b) categorize familiar objects from at least four months, and c) readily categorize unfamiliar object categories by seven months. Here, we will draw on these studies to define types of research questions that are suitable for FPVS studies, develop best practices for developmental FPVS studies, and evaluate challenges of applying FPVS with developmental populations theoretically and empirically.

**<https://bcccd.slack.com/archives/C02QDS23CSC>**

**Session 10 [Thursday, January 13, 20:30 - 22:00 (UTC +0)]**

**Session 6 [Wednesday, January 12, 13:00 - 14:30 (UTC +0)]**

## A-0074 Combining Forces for Causal Reasoning

Salih Can Özdemir<sup>1</sup>, Eda Demir<sup>1</sup>, Nathan R. George<sup>2</sup>, Tilbe Göksun<sup>1</sup>

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Children's understanding of complex physical interactions can be a strong indicator of their causal reasoning (Göksun et al., 2013). Force dynamics is not only about simple cause-effect relations, but refers to the interaction of forces within an event (Talmy, 1988). The present ongoing study investigates 4-year-olds' (n=29) causal representation and understanding of one or two forces on an object's movement. In an online task, causal scenes were presented where fans (i.e., forces) were situated at the sides of a round table, with a ball in front of one fan. When fans were turned on, they would push the ball away. In different compositions, fans either caused, enabled or prevented the motion of the ball and the consequent outcome. Children predicted where the ball would end up in questions of direction or distance, by picking one of the colored squares on the table. The results showed that children had the worst performance when two fans were placed at a 90° angle, where interaction of two forces made the ball move diagonally. Children were better at trials with one causing force, two enabling forces placed side-by-side, or two preventing forces placed across each other. Moreover, children had the worst performance with questions asking the distance the ball would take, compared to questions asking the direction the ball would go. These results suggest that 4-year-old children can reason about different causal interactions, but they can fail when compositions become more complex, and when questions require precise integration and prediction of forces.

<https://bcccd.slack.com/archives/C02PSCUA4QL>

**Session 8 [Thursday, January 13, 07:00 - 08:30 (UTC +0)]**

**Session 12 [Friday, January 14, 13:00 - 14:30 (UTC +0)]**

**A-0076 Inequity aversion in preschoolers (4 - 6) and school age (7 - 12) children**Adrienn Král<sup>1,2</sup>, Mónika Sándor<sup>3</sup>, Ádám Kun<sup>1,2</sup>

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For human cooperation, fair resource sharing is very important which is promoted by inequity aversion. We measured the inequity aversion of children between the ages of 4 and 12 to examine how fairness behaviour functions in them. Our aim was to investigate how young children respond to disadvantageous inequity (when their partner gets more candies) and advantageous inequity (when they get more candies).

Children played with same sex individuals from another (pre)school group a simple choice game in which they decided between two allocations of candies. One of them acts as the decider who directly affect the choice between allocations, meanwhile the other child is a passive partner. Every child faced two treatments, in which they had to decide between different equal amounts (1 candy or 0 candy for both of them) and an unequal amount (1 to the decider and 4 to the partner).

More than 50% of the children choose the equal allocation if they can get a candy. On the other hand, even though the allocation is disadvantageous and favours the partner, more 70% of the children chose the 1:4 allocation, instead of the allocation in which they would not get any candy. Children between the ages of 7 and 9 choose the equal allocation more often than younger or older children.

<https://bcccd.slack.com/archives/C02PQ4WJHNE>

**Session 7 [Wednesday, January 12, 20:30 - 22:00 (UTC +0)]**

**Session 6 [Wednesday, January 12, 13:00 - 14:30 (UTC +0)]**

## **A-0078 Skill consolidation in typical development and Tourette syndrome: Evidence for one-year retention**

Eszter Tóth-Fáber<sup>1,2,3</sup>, Zsanett Tárnok<sup>4</sup>, Ádám Takács<sup>5</sup>, Karolina Janacsek<sup>2,3,6</sup>, Dezső Németh<sup>2,3,7</sup>

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Extraction of regularities from the environment underlies human learning and contributes to the acquisition of automatic behaviors such as skills and habits. At least two types of regularities contribute to acquiring skills: (1) statistical, probability-based regularities and (2) serial order-based regularities. Here, we aimed to investigate the consolidation of such regularities in typical and atypical development. In Study 1, we recruited 9-15-year-old typically developing children and adolescents to perform a visuomotor four-choice reaction time task which measures both regularities simultaneously. They were retested on the same task 5 hours and 1 year later without any practice in the offline periods. Participants successfully retained both types of knowledge following both offline periods. Retention was independent of age, offering indirect evidence for the developmental invariance model of skill consolidation. In Study 2, we examined children with Tourette syndrome, which is a neurodevelopmental disorder characterized by repetitive movements and vocalizations called motor and vocal tics, respectively. Tics and habits show phenomenological similarities and overlap on the neural level. The study design was identical to the one employed in Study 1. Children with Tourette syndrome and matched typically developing controls acquired and retained the probability-based regularities both over the five-hour and one-year delay, with comparable performance between the groups. Children with TS did not acquire the serial order-based regularities; therefore, retention could not be reliably tested. These findings show that the representation of probability-based regularities is stable over a long period of time both in typical development and Tourette syndrome.

<https://bcccd.slack.com/archives/C02Q2PAUBQ9>

**Session 1 [Monday, January 10, 20:30 - 22:00 (UTC +0)]**  
**Session 11 [Friday, January 14, 07:00 - 08:30 (UTC +0)]**

## **A-0079 What to do with bad reliability? - The effect of data filtering methods**

Tamás Szűcs, Attila Krajcsi

Eötvös Loránd University, Budapest, Department of Cognitive Psychology

Reliability is underreported in the cognitive science literature and when it is reported it is often low. The typically low number of trials in cognitive developmental studies makes them especially prone to bad reliability. This is an issue because, e.g., bad reliability can attenuate the retrievable correlation coefficient, or it can decrease statistical power. Thus, it is important to take reliability into account in studies focusing on individual differences. One of the ways of dealing with bad reliability is attempting to filter out unexplained variance, or noise and raise the reliability.

In the current study, we examined the possibilities of increasing the reliability of variables using two data filtering techniques: filtering out supposedly noisy trials (1), and attempting to account for unexplained variance by entering additional regressors into a multiple regression model (2).

We analyzed the reliability of three numerical effects in the number comparison task measured with different metrics (e.g. reaction times, error rates and drift rates) and the reliability of the lure discrimination index in the abstract pattern separation task and the mnemonic similarity task. Reliability was calculated using Spearman-Brown corrected even-odd split-half reliability and an additional bootstrapping technique that circumvents some of the known issues of the split-half coefficient.

Surprisingly, our results show that data filtering techniques do not increase the reliability of variables, instead showing very inconsistent effects. Our results suggest that current data filtering practices should be re-evaluated in various areas, including developmental research.

**<https://bcccd.slack.com/archives/C02PQ5W9W4T>**

**Session 2 [Tuesday, January 11, 07:00 - 08:30 (UTC +0)]**

**Session 6 [Wednesday, January 12, 13:00 - 14:30 (UTC +0)]**

**A-0080 Co-collectors: Partner choice in a collaborative tablet game**Laura Schlingloff<sup>1</sup>, Maayan Stavans<sup>1</sup>, Barbu Revencu<sup>1</sup>, Gergely Csibra<sup>1,2</sup><sup>1</sup>Central European University, Austria/Hungary; <sup>2</sup>Birkbeck, University of London, UK

Influential theories suggest that social interactions are regulated by partner choice decisions based on cooperation-relevant traits, which people infer by observing the behavior of potential partners. The most relevant traits are the partner's ability (e.g., skills) and willingness (e.g., prosociality) to contribute to others' welfare.

In this project, we test whether 5- to 10-year-old children (n=65) and adults (planned n=32) indeed use information from observed third-party social interactions for partner choice. We designed a touchscreen foraging game in which participants watch and interact with animated agents who vary along specific traits (competence, prosociality, or both), and where the player's payoff partially depends on their partner. In a previous experiment, we showed that 5- to 10-year-olds can accurately identify which agent is more skilled or more helpful after watching stimuli from the game in a third-party context.

In the current study, we test whether children's and adults' own partner choice is informed by these observations: During the game, they select one of the previously observed agents to collaborate with. Participants are not explicitly informed or asked about traits or behavioral differences. Hence, if they systematically prefer partners whose behavior is indicative of a particular trait, it would show that their trait inference from behavioral observation informs their selection of an interaction partner.

Besides testing whether participants prefer a skilled and helpful collaborator, we can probe which trait they prioritize when the two are in contrast.

Data collection is ongoing, and findings will be presented at the conference.

**<https://bcccd.slack.com/archives/C02PHDY3LPQ>**

**Session 1 [Monday, January 10, 20:30 - 22:00 (UTC +0)]**

**Session 2 [Tuesday, January 11, 07:00 - 08:30 (UTC +0)]**

## **A-0081 The Effects of Visual Stimulus Complexity on Infant Curiosity: An Online Study**

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Lorijn Zaadnoordijk, Oscar Markey, Aoibhe De Burca, Maeve Kelly, Rhodri Cusack  
Trinity College Dublin, Ireland

Infants do not just learn by passively observing but also by actively directing their attention, a behavior that has been dubbed curiosity-driven learning. Curiosity-driven learning has long been theorized to be an important learning mechanism (Berlyne, 1954), hypothesizing that curiosity is a state of arousal with the degree of novelty determining infants' ability to learn. The spectrum of arousal is subdivided into the three zones: relaxation, curiosity, and anxiety (Day, 1982), where relaxation and anxiety are considered to create little opportunity for learning by being too boring or complex. Recent empirical research shows that infants indeed attend longest to stimuli that are at an intermediate level of complexity; a finding that was dubbed 'the Goldilocks effect' (Kidd, Piantadosi, & Aslin, 2012; 2014). Moreover, recent research showed that infants seek out those stimuli that maximize learning (Poli, Serino, Mars, & Hunnius, 2020). These previous studies have tested curiosity-driven learning in infants in the context of sequence complexity. Here, we investigated whether a similar u-shaped effect would be observed for stimuli of different visual complexities. Two separate measures of visual complexity were used to define three levels of complexity: simple cartoons, complex cartoons, and live action movies. In a within-subjects design, 1- to 14-month-old infants were shown three-minute movie clips per complexity level. We are using a browser-based platform to acquire infants' looking behavior measures via online webcam recordings. In our presentation, we will discuss our results and how they should be interpreted in the context of curiosity-driven learning in infancy.

**<https://bcccd.slack.com/archives/C02PHDYBJ5C>**

**Session 4 [Tuesday, January 11, 20:30 - 22:00 (UTC +0)]**

**Session 9 [Thursday, January 13, 13:00 - 14:30 (UTC +0)]**



## **A-0082 Dangerous ground or spectacular leap? Do we attribute value by cost-benefit analysis?**

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Anna Krämer, Josef Perner

University of Salzburg, Austria

When do children understand that a goal is not simply the end-point of an action, but something of value? According to Liu et al. (2019), 13-month-old children infer the value of a goal from the danger of an action using a cost-benefit analysis. When shown an agent jump (or refuse to jump) over trenches of different depth to meet up with one of two individuals, infants expected the agent to approach that individual for which the agent had accepted a higher risk (viz. jumped over a deeper trench). We replicated Liu's findings with N = 32 adults (M = 30.25 years), of which 88% expected the agent to approach the 'higher risk' individual. However, in a changed version 81% of the adults also expected the agent to go to the individual present at the leap over the deepest trench, when the other trials ruled out a cost-benefit analysis. This speaks in favor of an attention hypothesis that the most spectacular leap draws attention to the bystander individual. At test, participants attend more strongly to that individual and use it for their prediction. In a next step, we want to see whether the attention hypothesis also applies to infants.

**<https://bcccd.slack.com/archives/C02Q2PH2CBB>**

**Session 10 [Thursday, January 13, 20:30 - 22:00 (UTC +0)]**

**Session 3 [Tuesday, January 11, 13:00 - 14:30 (UTC +0)]**

## **A-0083 Making Online Testing Accessible Across the World: Insights from ManyBabies-AtHome**

Lorijn Zaadnoordijk<sup>1</sup>, Christina Bergmann<sup>2</sup>, Helen Buckler<sup>3</sup>, Rhodri Cusack<sup>1</sup>, Sho Tsuji<sup>4</sup>, Ana Maria Portugal<sup>5</sup>, Agata Bochynska<sup>6</sup>, ManyBabies-AtHome Consortium

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Laboratory studies of infant development frequently rely on the measurement of infant looking behavior. Typically, such experiments are conducted under highly standardized conditions to control factors such as distance between participants and the screen, movement, lighting, and ambient noise. At present, most psychology experiments use participants from a small section of the world's population, and we do not know if they will generalize. Online testing holds great promise towards more ecologically valid, more highly powered, and more representative experiments. Caregivers do not face the burden of a lab visit, making it easier to access populations beyond those living in proximity of an infant lab and enabling testing of more diverse populations (e.g., urban vs rural areas, various different nationalities), both within and beyond the researcher's home country. Recently, there have been several promising initiatives to move experiments online to allow caregivers to participate from their home environments. Despite tremendous advances in at-home testing, there are significant obstacles, especially when aiming to increase accessibility to a wide range of participants. To address these challenges, we set up ManyBabies-AtHome. This project aims to collaboratively address the challenges of infant online testing across the world, such as dealing with data protection regulations, language and cultural barriers, and recruitment strategies. ManyBabies-AtHome aims to establish and translate generally applicable solutions in procedure, documentation, standardization and analysis for online testing. In our presentation, we will discuss the steps we are taking to make online testing possible cross-culturally and outline various ways to get involved.

**<https://bcccd.slack.com/archives/C02P9FKLQKZ>**

**Session 7 [Wednesday, January 12, 20:30 - 22:00 (UTC +0)]**

**Session 12 [Friday, January 14, 13:00 - 14:30 (UTC +0)]**

**A-0084 The role of accent and speaker certainty in children's selective trust**Ajna F. Kertesz<sup>1</sup>, Joseph Alvarez<sup>2</sup>, Maya Afraymovich<sup>2</sup>, Jessica Sullivan<sup>2</sup><sup>1</sup>University of Texas at Austin, Austin, TX, USA; <sup>2</sup>Skidmore College, Saratoga Springs, NY, USA

Native English-speaking children prefer native English speakers over foreign-accented English speakers (Girard & Goslin, 2008; Kinzler et al., 2009; Kinzler et al., 2011). Young children also distrust speakers who use uncertain language (e.g., "I guess") relative to those who use certain language (e.g., "I know, I'm sure"; Jaswal & Malone, 2007; Kim et al., 2012; Koenig & Harris, 2005). The present study asks how information about the speaker's certainty interacts with the speaker's accent. In particular, we asked whether speakers who are perceived as less reliable (foreign-accented individuals) are perceived as more reliable when they provide linguistic cues to certainty. We showed 89 typically developing monolingual native English-speaking 3- to 6- year-olds from North America pairs of videos in which two possible functions for a novel toy were introduced. We manipulated three variables: (1) whether the speaker introducing each function was a native- or foreign-accented English speaker; (2) whether the speaker expressed certainty or uncertainty about the function of the object; and (3) whether the experimenter who interacted with the child was a native- or foreign-accented English speaker. We found a strong preference to learn from native speakers and found that this preference was impacted by the use of certainty cues. These data are important for what they tell us about how children weigh different sources of information when deciding who to learn from. They are also of practical importance: if children are less likely to learn from foreign-accented speakers, then this has large implications for caregivers and educators.

<https://bcccd.slack.com/archives/C02PHDWB4DU>

**Session 4 [Tuesday, January 11, 20:30 - 22:00 (UTC +0)]**

**Session 3 [Tuesday, January 11, 13:00 - 14:30 (UTC +0)]**

## **A-0087 Social Modulation of Infant's Location Memory in the A-not-B paradigm**

Clara Schüler, Kathrin Rothmaler, Charlotte Grosse Wiesmann  
Max Planck Institute for Human Cognitive and Brain Sciences

With this study, we want to test whether location memory in 1.5 to 3-year-old children is modulated by the presence and eye gaze of an agent in a modified touchscreen version of the A-not-B paradigm. Previous studies have suggested an influence of the social context on infants' performance (Topal et al. 2008; Dunn and Bremner 2019). Based on these studies, here we hypothesized that young children remember the location of objects better, if they have witnessed their hiding together with another agent. Specifically, infants are presented with videos on a touchscreen where an object is hidden in one of two containers (location A). Infants are allowed to search for the object by tapping the touchscreen. Then, the object's hiding location is changed from location A to location B. In a social condition, the object is hidden by an animated agent on B trials. In a non-social condition, no agent is present during the hiding process on B trials. We predict that children show a better location memory, and thus fewer errors on the B trials, in the social than the non-social condition. Data collection is ongoing, but preliminary results with 20 kids show a tendency that children indeed make fewer perseverative errors when the object was hidden in the B location by an agent compared to the non-social condition when no agent is present.

**<https://bcccd.slack.com/archives/C02QDRZMS48>**

**Session 1 [Monday, January 10, 20:30 - 22:00 (UTC +0)]**

**Session 2 [Tuesday, January 11, 07:00 - 08:30 (UTC +0)]**

## **A-0088 Sleep disturbances are correlated with executive dysfunction in young children with autism spectrum disorder**

Saeid Sadeghi, Hamid Reza Pouretamad

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**Abstract:** One of the common features of an autism spectrum disorder (ASD) is the presence of sleep problems. Recent studies have examined the relationship between sleep problems and cognitive functions in people with ASD. However, we have no information at an early age. Early research in predictors of cognitive abilities of ASD provides valuable opportunities to study autism before confounding effects of interventions, development of compensatory strategies, and comorbid syndromes and disorders have begun to impact its manifestation. So, the primary goal of this study was to examine the relationship between sleep disturbances and executive functions (EFs) in young children with ASD.

Cross-sectional data were collected from mothers of thirty-one young children with ASD (27 males, 4 females; mean age=32.90 months; range 20–54 months). The Gilliam autism rating scale (GARS-2), the behavior rating inventory of executive functioning-preschool version (BRIEF-P), and the children's sleep habits questionnaire (CSHQ) were administered to mothers.

We found significant associations between parent-reported children's sleep disturbances and executive functions problems. There was a lack of association between sleep disturbances and social interactions deficits and stereotypical behaviors.

These results support a link between sleep problems and executive dysfunction in children with ASD. Future research on EFs in young children with ASD may benefit from focusing on early intervention for sleep problems.

**<https://bcccd.slack.com/archives/C02PM6R08A1>**

**Session 8 [Thursday, January 13, 07:00 - 08:30 (UTC +0)]**

**Session 3 [Tuesday, January 11, 13:00 - 14:30 (UTC +0)]**

## **A-0090 Do words and actions affect object categorization differently across early development ?**

Ricarda Bothe<sup>1,2</sup>, Nivedita Mani<sup>1,2</sup>

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From early on, children categorize objects based on object appearance and words, but not tones. Words are thus particularly salient in early object categorization because they help infants to associate objects and object labels in meaningful ways as infants create sensible concepts about their world. Actions and object movements are also very salient for infants because actions help directing the infant's selective attention towards the moving object, specifically during the first year of life when linguistic knowledge is premature. In a web-based looking time study, we now compare how these two types of input cues (i.e., object labels & actions) affect object categorization differently at 1- and 2-years of age. Across four conditions (no-cue, word-cue, action-cue, word-action-cue), we first present infants (n=180) with eight videos of single objects with varying perceptual features that share category membership. Infants saw objects either being accompanied by a word, an action, both or no additional cue. At test, infants saw another object of the just-learned category and a novel object from a different category side-by-side on the screen. Increased looking at the novel object from a different category at test is typically interpreted as evidence for category formation and generalization of the objects from the just-learned category. Differences in the extent to which words and actions influence category formation will allow us to identify what input cues drive category formation at different stages in early development as well as the mechanisms underlying such early associative and category learning.

**<https://bcccd.slack.com/archives/C02PSCWS44C>**

**Session 5 [Wednesday, January 12, 07:00 - 08:30 (UTC +0)]**

**Session 6 [Wednesday, January 12, 13:00 - 14:30 (UTC +0)]**

## **A-0091 How does the infant brain consolidate linguistic rules in long-term memory?**

Anna Martinez-Alvarez<sup>1</sup>, Judit Gervain<sup>1,2</sup>

<sup>1</sup>University of Padua, Italy; <sup>2</sup>CNRS- Université Paris Descartes, France

Rule learning is a basic mechanism underlying language acquisition. Young infants' abilities to learn structural rules from linguistic stimuli have, therefore, received considerable attention both at the behavioral and the neural level. What has been much less explored is how the infant brain then consolidates linguistic rules in long-term memory. Here, we examined overnight cortical reorganization after exposure to a non-adjacent dependency (AXB) using near-infrared spectroscopy (NIRS) brain imaging.

Six-month-old infants were tested twice; sessions 1 and 2 assessed rule learning and rule consolidation, respectively. In both sessions, infants heard sequences following an AXB rule (e.g. "pedibu", "pegabu") and otherwise similar random sequences as the control condition (e.g. "dibupe", "bugape"). Infants' hemodynamic response was measured in the temporal, parietal, and frontal areas. The Control Group had no overnight sleep (1-7 hours) between sessions, while the Consolidation Group was re-tested 1-7 days after Session 1; i.e. had at least one overnight sleep between sessions. Cluster-based permutation tests over oxyHb concentration in session 2 revealed canonical responses (activations more positive than baseline) in both groups and conditions, localized in fronto-temporal regions. Importantly, results also revealed inverted responses (activations less positive than baseline) in parietal regions in both conditions, but only the Consolidation group. Since this effect is only observed in the Consolidation group, it cannot simply be attributed to repeated testing, but rather indicates an overnight consolidation process. These results suggest that parietal regions contribute to long-term memory consolidation in the infant brain.

<https://bcccd.slack.com/archives/C02Q2PAKDJM>

**Session 10 [Thursday, January 13, 20:30 - 22:00 (UTC +0)]**

**Session 2 [Tuesday, January 11, 07:00 - 08:30 (UTC +0)]**

## **A-0093 Sources of Individual Differences in Infants' Looking Preference for Physically Impossible Events**

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Infants are drawn to events that violate their expectations about the natural world: they look longer at events that are physically impossible, such as when a car passes through a solid wall (Baillargeon, 2004). This type of enhanced visual exploration shows stable individual differences in childhood (Perez & Feigenson, 2021). Do infants' visual preference for physically impossible events reflect an early form of curiosity? And if so, what factors contribute to individual differences in this early form of curiosity? Here, we tested whether infants' curious tendencies in daily life and caregivers' curiosity-promoting behaviors predict their looking preferences for physically impossible events. We presented infants (N = 47, Mage = 16 months) with events that violated core object representations (e.g. a car passing through a wall) and closely matched possible events (e.g. a car stopping upon hitting a wall). Caregivers completed a survey to measure (1) infants' everyday curious behaviors (e.g. exploration, information requests) and (2) caregivers' curiosity-promoting activities. Infants' preference for looking at physically impossible compared to possible events was predicted by parental reports of infant curiosity ( $r = .29$ ,  $p = .03$ ), but not infants' temperament or vocabulary size (all  $p$ 's  $> .05$ ), suggesting that infants' visual preference for physically impossible events reflects an early form of curiosity. Additionally, infants' looking preference was positively predicted by parental engagement in curiosity-promoting activities ( $r = .32$ ,  $p = .02$ ), but not parents' own curiosity levels ( $p > .05$ ), suggesting that parent-child interaction may play an important role in shaping early curiosity.

<https://bcccd.slack.com/archives/C02Q2PCSBED>

**Session 10 [Thursday, January 13, 20:30 - 22:00 (UTC +0)]**

**Session 7 [Wednesday, January 12, 20:30 - 22:00 (UTC +0)]**



## **A-0094 EEG $\mu$ rhythm and network connectivity to emotional faces in 7-months-old infants**

Silvia Polver<sup>1</sup>, Ermanno Quadrelli<sup>1,2</sup>, Elisa Roberti<sup>1,2</sup>, Hermann Bulf<sup>1,2</sup>, Chiara Turati<sup>1,2</sup>

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Existing literature documented the recruitment of sensorimotor areas during the expression and observation of emotional faces. Although considerable efforts have been devoted to elucidating the neural underpinnings of the early development of emotion processing, little is known about the role of sensorimotor areas in the processing of facial expressions in infancy. The present study aims at investigating 7-month-olds' sensorimotor activity and network configurations in response to static and dynamic facial expressions of emotions. Sensorimotor activity, as indexed by  $\mu$  rhythm suppression, and network efficiency, as quantified by graph measures, were recorded through EEG while infants were presented with static (N= 19) or dynamic (N= 19) angry, happy, and neutral facial expressions. Results showed that happy faces elicited greater sensorimotor activity compared to angry faces during dynamic presentations, while no difference was found between emotional expressions in the static condition. Furthermore, happy expressions elicited greater right-lateralized activity during dynamic stimuli presentation, and dynamic emotional faces were characterized by a more efficient processing, as they elicited higher global efficiency and lower networks' diameter compared to static faces. Overall, results suggest that dynamic emotional expressions modulate sensorimotor activity as early as 7 months of age and are more efficiently processed by functional brain networks. Finally, evidence regarding the presence of a right-lateralized activity for the processing of happy facial expressions supports the hypothesis of a prominent role of the right hemisphere in the processing of emotional information.

<https://bcccd.slack.com/archives/C02PSCQN4LC>

**Session 8 [Thursday, January 13, 07:00 - 08:30 (UTC +0)]**

**Session 9 [Thursday, January 13, 13:00 - 14:30 (UTC +0)]**

## **A-0095 A meta-analysis of fNIRS studies on infants' detection of repetition- and diversity-based regularities in speech**

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Meta-analytic studies are key to assessing the robustness and replicability of reported effects. Yet very few exist in the infant fNIRS literature. Using this approach, we investigated infants' abilities to extract two types regularities from speech that are proposed to follow different developmental paths: (1) repetition-based regularities (AAB: mumuba, ABA: mubamu), (2) and diversity-based regularities (ABC: mubage). Individual studies suggest that infants show significant hemodynamic responses to repetitions, but not to diversity-based structures at birth, but by 6 months, they also encode diversity. In this work, we evaluated the developmental trajectory of the processing of these structures with a meta-analytic approach.

We examined 19 published and unpublished fNIRS studies, testing brain responses with speech stimuli (16), tones (1), sign (1), or non-linguistic visual stimuli (1) in newborns and 6-9-month-olds. We calculated variance-weighted effect sizes for oxyHb concentration in response to both regularities as compared to baseline in the left temporal lobe, using random-effects models.

Overall meta-analytic effect sizes were small but significant (repetition-based: 0.26, CI [0.17, 0.35],  $p < .001$ ; diversity-based: 0.19, CI [0.09, 0.29],  $p < .001$ ). For speech stimuli (16 studies), responses to repetition-based structures had a small, but significant effect size in both age groups (birth: 0.29, CI [0.18, 0.40]; 6-9 months: 0.28, CI [0.14, 0.42]; both  $p < .001$ ), while responses to diversity-based structures were only significant at 6-9 months (0.27, CI [0.09, 0.44],  $p = .003$ ). Analysis of potential moderators is currently undergoing. These results confirm that infants detect repetition from birth, but are not yet able to encode diversity-based structures.

<https://bcccd.slack.com/archives/C02PQ4ZJXJN>

**Session 4 [Tuesday, January 11, 20:30 - 22:00 (UTC +0)]**

**Session 8 [Thursday, January 13, 07:00 - 08:30 (UTC +0)]**

## **A-0096 Tracking Altercentric and Egocentric Biases in a Continuous False Belief Task**

Feride Nur Haskaraca Kizilay<sup>1</sup>, Marina Proft<sup>1</sup>, Marie Luise Speiger<sup>2</sup>, Charlotte Grosse Wiesmann<sup>2</sup>, Ulf Lischkowski<sup>3</sup>, Hannes Rakoczy<sup>1</sup>

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Social cognition is subject to specific biases: Egocentric bias refers to the phenomenon that individuals are slowed down and led into error by their own perspective when explicitly asked to focus on others' perspectives. Altercentric bias suggests that our own judgments are modulated by how we think other agents perceive the world, indicating that we implicitly represent their perspectives, even when those are irrelevant or interfere with our own task. In two online studies, we investigated both types of biases within one task format that combines two methods from previous studies: (1) the Sandbox task, which was developed to measure egocentric bias in a modified standard false belief scenario with continuous -rather than discrete- locations; and (2) mouse tracking measures, which originally aimed to tap altercentric bias as revealed by the detours in participants' mouse movements. In Study 1, 94 German- and 94 English-speaking adults were tested either on the egocentric or the altercentric bias. Each subject received two types of trial per bias: experimental (measures biases arising from conflicting perspectives) vs. control (controls for baseline biases that are irrelevant for perspective taking, e.g., memory bias). Within-subject comparisons of trials, however, revealed no difference between the biases shown in the experimental vs. control trials for neither bias/group. Study 2 tested 54 German-speaking adults on both egocentric and altercentric biases to investigate possible carry-over effects across biases. However, no difference between experimental and control trials has been observed for neither type of bias, regardless of the order they were presented.

<https://bcccd.slack.com/archives/C02P9FRHHJB>

**Session 10 [Thursday, January 13, 20:30 - 22:00 (UTC +0)]**

**Session 9 [Thursday, January 13, 13:00 - 14:30 (UTC +0)]**

## **A-0097 Direct Object Acquisition by L2 Russian Learners: an Experimental Study**

Sofia Krasnoshchekova<sup>1,2</sup>, Kseniia Kashleva<sup>3</sup>

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In this paper we analyzed direct object (DO) acquisition in adult L2 Russian learners. A DO in Russian is usually a noun or a pronoun in accusative. Other constructions, semantically and syntactically identical to a standard DO, are a genitive group, a prepositional group, a sentential argument, and an adverbial group.

We took 17 most frequent transitive verbs and designed 3 types of stimuli with them: fill in the gaps; complete a sentence; decide if a sentence is correct or not (if not, correct it).

We compared L2 learners with natives and with corpus data. Sure, there is a significant difference between L2 learners of almost all levels and Russians or the corpus in producing correct sentences. It was found that there are no significant differences between L2 speakers, L1 speakers, and the corpus in using nouns in accusative, infinitives, prepositional groups, and sentential arguments as DO. Accusatives, infinitives, and sentential arguments are the most frequent DO, so L2 learners are taught to use them above all. However, there are certain tendencies for difference between L2 informants of lower and higher levels in using pronouns, adverbial groups and genitives. There is a significant difference between L2 learners of A1, A2, and B1 levels and the corpus in using non-objects instead of DO. Produced sentences were correct, even without having a DO.

It can be concluded that although Russian is a highly fleective language with many agreement rules, L2 learners acquire DO patterns quite successfully regardless of their level.

**<https://bcccd.slack.com/archives/C02PQ5W596F>**

**Session 8 [Thursday, January 13, 07:00 - 08:30 (UTC +0)]**

**Session 12 [Friday, January 14, 13:00 - 14:30 (UTC +0)]**

## **A-0098 The interplay between parental input, children's interests and word learning in children**

Rajalakshmi Satarai Madhavan<sup>1,2</sup>, Nivedita Mani<sup>1,2</sup>

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Background: Parental language input is vital for children's vocabulary growth (Hart & Risley, 1995), and every-day activities like shared book-reading have been shown to boost language acquisition (Mol, Bus, deJong, & Smeets, 2008). Simultaneously, research also suggests that children actively influence their learning, by eliciting information they are interested in and retaining such information better (Mani & Ackermann, 2018). However, investigation of the extent to which children's active interest modulates the quality of caregiver-child interaction when engaging in activities is lacking. Research questions: Is the quality of caregiver-child interaction (QOI) during a semi-naturalistic task like shared book-reading modulated by children's interest in the discussion content? Is there a combined effect of QOI and children's interests on children's learning?

Methodology: This online study has three parts: (1) Shared book-reading task where parents read two books to their child – one previously determined to be of low and one of high interest to the child (with one novel word-object mapping introduced in each book), (2) preferential-looking task and parental questionnaire to assess children's interest in our book-categories and (3) eye-tracking task to test later recognition of newly-introduced word-object mappings.

Hypotheses and implications: We predict that (1) QOI will be higher during high-interest book-reading (2) children will show improved learning of novel word-object mappings when QOI during book-reading and interest in object category is high. Taken together, this study examines how parents respond to children's interests in a semi-naturalistic setting, and how such responsiveness and these interests combine to boost language learning.

<https://bcccd.slack.com/archives/C02PHDUJW5C>

**Session 11 [Friday, January 14, 07:00 - 08:30 (UTC +0)]**

**Session 12 [Friday, January 14, 13:00 - 14:30 (UTC +0)]**

## **A-0099 Ethnicity and Perspective-Taking Across The Lifespan**

Kirandeep K. Dogra, Liam A. Ruel, Daniel M. Bernstein

Kwantlen Polytechnic University

Perspective-taking affects our everyday social interactions. Past work has shown that younger adults have better perspective-taking skills than do children and older adults. People from Western cultures (e.g., Caucasian) also tend to have better perspective-taking skills than do people from Eastern cultures (e.g., East Asian, South Asian, Middle Eastern). To our knowledge, our research is the first to examine the links between ethnicity and various forms of perspective-taking across the lifespan (N = 515; Age Range = 3 years to 98 years). The present work examined three forms of perspective taking; hindsight bias (i.e., claiming that past events in hindsight were more predictable than they were in foresight), emotion recognition (i.e., identifying emotions in pictures of people's eyes) and theory of mind (i.e., understanding others' mental states). Results reveal patterns consistent with previous research, while extending that work to a lifespan sample. Adults showed the least hindsight bias (i.e., best perspective-taking) and the best emotion recognition compared to all other age groups, which did not differ from each other on these measures. As for ethnicity, participants from Western cultures showed less HB and more emotion recognition than participants from Eastern cultures. Age and ethnicity had no effect on our measure of ToM. Overall, these findings suggest better perspective taking in adults and people from Western cultures compared to children and people from Eastern cultures.

<https://bcccd.slack.com/archives/C02PHDSTCES>

**Session 7 [Wednesday, January 12, 20:30 - 22:00 (UTC +0)]**

**Session 9 [Thursday, January 13, 13:00 - 14:30 (UTC +0)]**

## **A-0101 Learning and selective attention have a bidirectional relationship in infancy**

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The assumption that learning and selective attention affect each other underlies many paradigms that use looking time and other eye-gaze behaviors to measure learning in infancy. Testing this assumed relationship is crucial to understand the active mechanisms supporting learning and attention in infancy. In this study, we collect eye gaze patterns from 30+ infants (age = 12 months) to measure their eye movements as they learn visual patterns based on statistical regularities (Rule Condition) or passively view patterns without learnable regularities (Control Condition). After being presented with the patterns (Training Phase), infants' learning outcomes are tested via looking time while stimuli are presented (Testing Phase). We analyze the differences in looking behavior during Testing Phase between the Rule Condition and the Control Condition and show that learning has an impact on selective attention. We further solidify the relationship by showing that different eye gaze patterns in the Training Phase are associated with different looking behaviors during the Testing Phase. Finally, we show that the components infants selectively attend to during Training Phase yield better learning outcomes in the Testing Phase. Taken together, our results reveal that learning and attention facilitate each other in infancy. In conclusion, our study shows that infants can use their eye gazes to actively engage with learning and that learning actively shapes their selective attention.

**<https://bcccd.slack.com/archives/C02PHDVN4S2>**

**Session 1 [Monday, January 10, 20:30 - 22:00 (UTC +0)]**

**Session 3 [Tuesday, January 11, 13:00 - 14:30 (UTC +0)]**

**A-0102 Toddler's responses to social events: A tablet-based approach**

Jesse Whiteman, Adarsh Vallurupalli, Jessica Sommerville

University of Toronto, Toronto, Canada

Little research to date has examined the development of third-party reward and punishment infants and young children. Evidence from studies aimed at understanding the origins of two central moral domains (care/harm and distributive fairness) suggests that a sensitivity to various types of norms is present in infancy. A critical question thus concerns whether, when, and how infants begin to intervene in response to norm adherence and transgressions. Reward, in response to norm adherence and punishment in response to norm transgression, are central ways in which adults intervene, particularly when norms are of a moral flavour, but their developmental trajectory through early childhood has not been characterized. Experiments using touchscreens have shown that 16-month-olds will spontaneously reward actors they have seen distribute resources fairly, but not punish actors they have seen distribute resources unfairly. To take this methodology further in terms of ecological validity and familiarity to subjects, we developed a tablet-based platform for studies of reward and punishment interventions using the Apple iPad and designed a replication experiment of the laboratory-based touchscreen studies with 16-month-olds (which found reward but not punishment interventions toward fair and unfair actors, respectively). We present initial data from these replication studies and discuss their implications for our understanding of the developmental emergence of an important class of behaviours supporting sociomoral norms and the evolutionary and cultural bases of cooperation.

**<https://bcccd.slack.com/archives/C02P9FLNB8F>**

**Session 4 [Tuesday, January 11, 20:30 - 22:00 (UTC +0)]**

**Session 12 [Friday, January 14, 13:00 - 14:30 (UTC +0)]**



**A-0103 Children's Motivation to Benefit the Group versus the Self**Jinrui Liu<sup>1</sup>, Li Guan<sup>2</sup>, Fan Yang<sup>1</sup>, Lin Bian<sup>1</sup><sup>1</sup>University of Chicago; <sup>2</sup>Cornell University

We are naturally self-interested, but to what extent are children willing to sacrifice own interests to benefit the group? We examined 4-9-year-olds' motivation and expectations about benefiting the group versus the self. Children were presented with two scenarios in counterbalanced order. In both contexts, children were introduced to two games, a fun yet less rewarding game and a boring yet more rewarding game. In the self-interest scenario, children would play these games to win rewards for themselves, whereas they would win rewards for their group in the group-interest scenario. Next, we measured children's game choices (e.g., "Which game do you want to play?"), expectations for own choice ("Which game do you think you should play"), and their predictions for a third-party, ingroup member's responses. Among US children (Study 1, N = 122), 4- to 5-year-olds were more likely to play (and think they should play) the more rewarding (but boring) game for themselves than for their group, whereas older children (6-7 and 8-9) responded similarly in the two contexts. Preliminary results of Chinese children (Study 2, ongoing, N = 86) revealed that older children (6-9) were also similarly motivated to benefit the self and the group. Together, the results suggest that with age children increasingly hold themselves (but not others) to a higher standard to benefit the group, such that by middle childhood, children are similarly willing to benefit the group and themselves at hedonic costs.

<https://bcccd.slack.com/archives/C02PQ5Z16KD>**Session 2 [Tuesday, January 11, 07:00 - 08:30 (UTC +0)]****Session 6 [Wednesday, January 12, 13:00 - 14:30 (UTC +0)]**

## **A-0105 The multimodal marking of discourse referents in children's narrative speech: Evidence from gesture and prosody**

Sara Muñoz-Coego, Júlia Florit-Pons, Patrick Louis Rohrer, Ingrid Vilà-Giménez, Pilar Prieto

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Developmental studies have suggested that children aged 3 to 7 use prosodic prominence to mark referents in discourse based on their information status, such that new and accessible (i.e., new to the hearer but inferable through the context) referents tend to be accented while given (i.e., old) referents are usually deaccented. However, little information is available about how children use other multimodal cues, such as gestures (both referential and non-referential), in referent marking. Therefore, this study aims to longitudinally assess how children use these multimodal cues to distinguish the information status of referents in narrative discourse.

Using a longitudinal database of 83 children performing a narrative retelling task at two time points in development (at 5-6 and 7-9; Vilà-Giménez et al., 2021), 332 videos were coded for gesture referentiality (referential/non-referential), information status of referents (new/given/accessible), and prosodic prominence (pitch-accented/deaccented).

Preliminary results showed that by age 5 children introduced new referents gesturally and prosodically. Also, our findings indicated that while 5- to 9-year-old children introduced given referents without gestural and prosodic markings, accessible referents tended to be marked prosodically, but not gesturally. Interestingly, we observed that at 7-9, children used non-referential gestures significantly more than referential gestures to mark new referents. These results suggest that while these multimodal cues develop in parallel, children at 7-9 are sensitive to referents that should be in the common knowledge yet have not been explicitly referenced, and choose to mark them prosodically rather than gesturally.

**<https://bcccd.slack.com/archives/C02PSCS4M9A>**

**Session 5 [Wednesday, January 12, 07:00 - 08:30 (UTC +0)]**

**Session 6 [Wednesday, January 12, 13:00 - 14:30 (UTC +0)]**

**A-0106 Development of visual categorization in infants and children**

Céline Spriet, Etienne Abassi, Jean-Rémy Hochmann, Liuba Papeo

Institute of Cognitive Sciences Marc Jeannerod, CNRS

We have recently reported that by 19 months, infants can extract category-relevant visual information from heterogeneous sets of objects, to form broad visual object categories (e.g., animate, inanimate, human, nonhuman). When does this process begin? And how does it continue at older ages? We studied the looking behavior of 6-month-olds and 3-year-olds, while they looked at pairs of images depicting human/nonhuman faces and bodies and big/small natural and artificial objects. We computed the difference in looking time (DLT) between the two images of each pair as a measure of representational similarity, under the assumption that the closer the visual representation for two objects, the lower the DLT. Thus, here, signature of categorization was lower DLTs for within-category pairs than for between-categories pairs. We also explored additional dynamic dimensions characterizing infants' looking behavior. Six-month-olds showed no evidence of categorization, but looked longer at the larger/more compact/less elongated of the two objects. The behavior of 3-year-olds could be accounted for by a model combining all of the pre-defined categorical dimensions, though the predictive power of broad categories appeared weaker than in 19-month-olds. Perhaps relatedly, 3-year-olds could name each image using basic-level category names (e.g., "camel" instead of "animate object" or "nonhuman animal"). The developmental course outlined by our current and previous results (Spriet, Abassi, Hochmann, Papeo, 2021) suggests that visual object categorization emerges after a first stage in which infants' behavior is guided by low-level features of the stimuli (6-month-olds) and evolves from broader categories (19-month-olds) to narrower distinctions (3-year-olds).

<https://bcccd.slack.com/archives/C02PSCPQJ4C>

**Session 11 [Friday, January 14, 07:00 - 08:30 (UTC +0)]**

**Session 3 [Tuesday, January 11, 13:00 - 14:30 (UTC +0)]**

## **A-0107 Preschool Children Can Use Flattery Online**

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Yue Bi<sup>1</sup>, Kelly Adelia<sup>1</sup>, Ng Xuan Ting Anthea<sup>1</sup>, Cheung Hoi Shan<sup>2</sup>, Xiao Pan Ding<sup>1</sup>

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Children as young as four years of age are able to flatter others in face-to-face interactions (Fu & Lee, 2007; Warneken & Orlins, 2015). The present study aimed to investigate whether children would flatter social partners online and examine whether children's theory of mind, parental mental state talk, and parent-child reciprocity could predict children's flattery. We conducted the experiment via Zoom video conference with a modified drawing-evaluation paradigm. A total of 116 children aged 4.5 to 6 participated in our study. Consistent with previous findings, we found that children rated a drawing more highly when the drawing's artist was present compared to when the artist was absent. This suggests that children can flatter social partners online despite the interaction being short and the interactor being distant. In addition, among children who used flattery in the experiment, we found the extent of their flattery (the amount of increase in their ratings after the experimenter declared that it was her drawing) to be positively associated with parent-child reciprocity. This result suggests that children who share more positive emotions with their parents are more likely to exaggerate their compliments towards others. The extent of children's flattery was not related to children's theory of mind and the frequency of mental-state words used by parents. In conclusion, this study found that preschool children flattered social partners in online interactions and pointed to the importance of parent-child reciprocity in children's use of flattery.

<https://bcccd.slack.com/archives/C02PQ4X1W58>

**Session 5 [Wednesday, January 12, 07:00 - 08:30 (UTC +0)]**

**Session 12 [Friday, January 14, 13:00 - 14:30 (UTC +0)]**

**A-0108 Investigating Children's Pragmatic Problems with the True Belief Task**

Lydia P. Schidelko<sup>1</sup>, Michael Huemer<sup>2,3</sup>, Lara M. Schröder<sup>2,3</sup>, Anna S. Lueb<sup>1</sup>, Hannes Rakoczy<sup>1</sup>, Josef Perner<sup>2,3</sup>

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The litmus test for the development of a meta-representational Theory of Mind is the False Belief (FB) task in which children have to represent how another agent falsely represents the world. Children typically start mastering this task around age four. Recently, however, a puzzling finding has emerged: Once children master the FB task, they begin to fail True Belief (TB) control versions of the task. Pragmatic performance limitation accounts assume that the TB task is difficult for pragmatic reasons: It is confusing since it poses a trivial academic test question about a rational agent's perspective; and we do not normally engage in such discourse unless there is at least the possibility of error or deviation. In the present study, we test the pragmatic performance limitation account by administering to three- to six-year-olds (N = 88) True and False Belief tasks and structurally analogous True and False Sign (FS/TS) tasks. The belief and sign tasks are matched in terms of representational and meta-representational complexity; the crucial difference is that FS/TS tasks do not involve a question that refers to the perspective of a rational agent and should thus be less pragmatically confusing. The results replicate the puzzling performance pattern in TB tasks, show parallel and correlated developments in FB and FS tasks, but show diverging patterns in TB and TS tasks: while performance declines with age in TB, it remains high in TS tasks. Taken together, these results speak in favor of the pragmatic performance limitation account.

<https://bcccd.slack.com/archives/C02PQ5UCNH1>

**Session 7 [Wednesday, January 12, 20:30 - 22:00 (UTC +0)]**

**Session 2 [Tuesday, January 11, 07:00 - 08:30 (UTC +0)]**

## **A-0109 Joint Attention in Infancy Predicts Referential Communication Skills in Toddlerhood**

Ezgi Yıldız<sup>1</sup>, Berna A. Uzundağ<sup>2</sup>, Aylin Küntay<sup>3</sup>

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Describing target entities so that they can be distinguished from competitors is part of referential communication skills which show rapid development in preschool ages (Lloyd et al., 1998). Sharing attentional focus with a caregiver on a third entity known as joint attention may foster referential communication skills by enabling infants to establish a common ground with caregivers and facilitating the development of language (Tomasello & Todd, 1983) and perspective-taking (Moll & Tomasello, 2004). In this first longitudinal study examining the precursors of children's referential communication skills, we investigated whether joint attention in mother-infant dyads predicts children's success in forming and repairing referential descriptions in toddlerhood. At 12 months of age, joint attention during 5-min free play in the laboratory was assessed in 24 mother-infant dyads. For each dyad, (1) the total time spent in joint attention, (2) the average duration of a joint attention episode were coded. At around 33 months of age, children completed an online referential communication task, which required them to describe the target pictures among competitors to the experimenter. Children's ability to form and repair descriptions was assessed by coding (1) whether their initial descriptions were uniquely identifying, (2) the number of communicative attempts needed to describe the target pictures. Mixed-effects regression analyses showed that the average duration of joint attention episodes in infancy was negatively associated with the number of children's description attempts (Estimate=-.49, SE=.23, p=.04), indicating that infants who established longer joint attention with their mothers had more advanced referential communication skills in toddlerhood.

**<https://bcccd.slack.com/archives/C02QDRX1S00>**

**Session 2 [Tuesday, January 11,07:00 - 08:30 (UTC +0)]**

**Session 6 [Wednesday, January 12,13:00 - 14:30 (UTC +0)]**

## **A-0110 Effects of Infant Directed and Adult Directed Auditory Stimuli on Infant Theta: An EEG Study**

Haley Paige Leerssen<sup>1</sup>, Stefanie Peykarjou<sup>1</sup>, Julia Wissner<sup>1</sup>, Christine Michel<sup>2</sup>, Sabina Pauen<sup>1</sup>

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This study used electroencephalographic (EEG) measures to investigate language processing in 7-month-old infants. Infants receive different language input than adults. Individuals often modulate prosody of normal speech, or adult directed speech (ADS), in characteristic ways when addressing infants, producing infant directed speech (IDS). This study focused on how infants process (1) IDS versus ADS and (2) words versus sounds in the theta functional power band (3.6 – 5.6 Hz). Three experiments used time-frequency analysis to explore how vocalizations, differing along speech register and linguistic properties, affect how intensely and where in the brain infants experience theta oscillations. Experiments 1 (N = 20) and 2 (N = 23) focused on how infants process IDS and ADS. Auditory stimuli were presented alternately in ID and AD speech and power spectral density ( $\mu V^2$ ) in the theta band was recorded. Results showed no significant deviations in how infants processed IDS and ADS stimuli ( $p > .05$ ). Experiment 3 (N = 17) focused on how infants process words (“Guck mal”) and sounds (“UA”). Stimuli were presented alternately, always spoken in IDS. Theta activation did not differ significantly between word and sound conditions ( $p > .05$ ). Results predominantly suggest that, regarding theta activation, 7-month-old infants do not differentiate in their processing of IDS versus ADS vocalizations or in their processing of words versus sounds. Investigating the location of primary activation revealed that increased  $\mu V^2$  emerged in patterns. The frontal-midline theta activation pattern observed is congruous with attention modulation as well as language and familiar/unfamiliar auditory stimulus processing.

<https://bcccd.slack.com/archives/C02QDS5GH88>

**Session 11 [Friday, January 14, 07:00 - 08:30 (UTC +0)]**

**Session 9 [Thursday, January 13, 13:00 - 14:30 (UTC +0)]**

## **A-0111 Screen Media Exposure in Early Childhood and its Relation to Children's Self-Regulation: A Systematic Review**

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Self-regulation, the ability to regulate thoughts, emotions, and behavior to control goal-directed activities shows a rapid development in the years comprising infancy, toddlerhood, and preschool ages. Early regulation-related skills like effortful control and executive functions predict later academic achievement and socioemotional adjustment. Studies suggest that children's self-regulation is related to their use of screen media. In this systematic review, we aimed to summarize and integrate the studies investigating the relationship between young children's screen media use and their self-regulation. We searched the ERIC, PsycINFO, PubMed, and Web of Science databases with the ("self-regulation" OR "executive function\*" OR "effortful control") AND ("media exposure" OR "mobile device" OR smartphone OR tablet OR technology OR TV OR "digital media" OR computer OR "screen media" OR "screen time") AND (infant\* OR child\*) keywords and identified 39 relevant articles. While screen time in infancy was negatively associated with self-regulation, findings were more inconsistent for later ages suggesting that screen time does not adequately capture the extent of children's screen media use. The findings further indicated that background TV is negatively related to children's self-regulatory skills whereas watching fantastical content seems to have immediate negative effects on children's executive functions. We suggest that future studies should take the content and context of children's screen media use into account and also focus on parent- and home-related factors such as parental behaviors that foster the development of self-regulatory skills.

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**Session 2 [Tuesday, January 11,07:00 - 08:30 (UTC +0)]**

**Session 3 [Tuesday, January 11,13:00 - 14:30 (UTC +0)]**



**A-0112 Parental Sound Symbolic Input Changes for Preterm and Term Infants**Şeref Can Esmer<sup>1</sup>, Erim Kızıldere<sup>2</sup>, Tilbe Göksun<sup>1</sup><sup>1</sup>Koç University, Istanbul, Turkey; <sup>2</sup>University of California, Davis, USA

Sound symbolism, the correspondence between speech sounds and meanings, contributes to children's vocabulary development and sound symbolic words are often used in the parental language input (Imai & Kita, 2014; Fernald & Morikawa, 1993). As children get older, parents' sound symbolic input decreases (Motemadi et al., 2020), possibly due to children's earlier vocabulary knowledge. If parents adjust their speech according to the needs of their children, they might change their input for different child populations (e.g., preterm children). This study investigates whether parental sound symbolic input for preterm (PT) and full-term (FT) are different beyond their receptive vocabulary knowledge at 14 months and 20 months.

We recruited sixty-two infants (28 PT, 28 girls), and measured their parents' sound symbolic input when infants were 14months (Mage= 13.71months, SD=1.40) and 20months (Mage= 20.05months, SD=1.29). Parental sound symbolic input was coded from 10-minute free play sessions at both time points. Words that have auditory or visual correspondence with their referent (meow-cat, hop- a circular movement) were coded from parental speech. The total of these words was divided by play session duration. Children's receptive vocabulary was measured by Turkish adaptation of MacArthur-Bates CDI.

Results showed that the interaction between time and neonatal status was significant when controlling for infants' receptive vocabulary,  $p=.036$ . Parental sound symbolic input decreased for FT children,  $p=.006$ , but not for PT children,  $p=.696$ . These results suggest that the change in sound symbolic input from 14 months to 20 months depends on infants' neonatal status even after controlling for infants' word comprehension.

<https://bcccd.slack.com/archives/C02PM6MAZPX>

**Session 2 [Tuesday, January 11,07:00 - 08:30 (UTC +0)]**

**Session 6 [Wednesday, January 12,13:00 - 14:30 (UTC +0)]**

## **A-0113 Functional brain networks related to audiovisual synchrony processing in ASD infant siblings: A pilot study with healthy adults.**

Silvia Polver<sup>1</sup>, Chiara Cantiani<sup>2</sup>, Elena Maria Riboldi<sup>2</sup>, Massimo Molteni<sup>2</sup>, Chiara Turati<sup>1,3</sup>, Valentina Riva<sup>2\*</sup>, Hermann Bulf<sup>1,3\*</sup>

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The overall aim of the project is to investigate audiovisual synchrony processing in 8-months-old infants at high familiar risk of Autism Spectrum Disorder (HR-ASD). From a developmental point of view, while a reflex-like orientation to social cues is present at very early stages of development in HR-ASD infants, infants later diagnosed for ASD present reflexive orientation persisting beyond its appropriate time window. This non adaptive persistence may result from considering stimuli as a composite of physical characteristics (Klin et al., 2015).

The present pilot study with healthy adults aims to provide preliminary evidence regarding time-varying functional connectivity responses to audiovisual synchronous and asynchronous stimuli. Our sample consists of 13 healthy adults which were presented with social (crying and laughing) and non-social (coughing) audiovisual recordings. Stimuli were presented in a synchronous or asynchronous condition. From EEG data we extracted the instantaneous phase and we computed Minimum Spanning Trees (MST) for each time point. On trees we computed the eigenvector centrality and applied the cluster-based statistic. Our preliminary results reveal the presence of a significant difference between laughter synchronous and asynchronous videos in the alpha band ( $t_{sum} = -36.8$ ,  $p < .05$ ). This result is in line with the role of the alpha band in social processes and in the integration on complex information (Mantini et al., 2007).

Despite the small sample size, results provide evidence for the reliability of our audiovisual task and measures and for their applicability in HR-ASD infants.

<https://bcccd.slack.com/archives/C02P9FJLA15>

**Session 7 [Wednesday, January 12, 20:30 - 22:00 (UTC +0)]**

**Session 3 [Tuesday, January 11, 13:00 - 14:30 (UTC +0)]**

**A-0114 Neural mechanisms of implicit and explicit Theory of Mind reasoning in preschool-aged children and adults: parallel fNIRS and fMRI studies**

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Although the neural mechanisms of the Theory of Mind (ToM) have been extensively studied in adults with the use of functional magnetic resonance imaging (fMRI), collecting such data in young children is considered ineffective due to the challenging testing environment (i.a. loud noise, necessity to lie motionless). As a result, the evidence concerning the neurocognitive basis of ToM in the period of its intensive development (between 3 and 5 years of age) is limited. Few studies have explored it in respect of the mature ToM mechanisms by using comparable stimuli in children and adults. The aim of the current study was to compare the neural patterns of responses related to ToM reasoning in preschoolers and adults. To this end, two hemodynamic-based neuroimaging methods have been applied (functional near-infrared spectroscopy, fNIRS, & fMRI). 83 typically developing children (age range 3-5 years) took part in the study with the use of fNIRS, which is considered a child-friendly alternative to fMRI. 58 adults (age range 18-43 years) participated in the fMRI session. Both age groups performed identical change-of-location false-belief tasks (FBT), in two implicit and explicit versions consisting of analogous stimuli. The analyses of general patterns of activation and ROI responses have been conducted. We demonstrate that similar responses related to implicit and explicit ToM reasoning can be observed within the temporo-parietal junction both in adults and in children. The relation between the patterns of activation and the behavioral results in explicit FBT task will be presented.

<https://bcccd.slack.com/archives/C02PSCSKBV2>

**Session 11 [Friday, January 14, 07:00 - 08:30 (UTC +0)]**

**Session 9 [Thursday, January 13, 13:00 - 14:30 (UTC +0)]**

## **A-0115 The social-communicative function of language and grammar acquisition: A case study of Japanese toddlers' acquisition of particles**

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Grammatical elements seem, on the face of it, difficult to master purely from observation. They can be quite abstract and laden with rule irregularities. Yet, somehow, young children largely master the grammar of their native language within the first few years of life. When studying how children may go about learning grammatical elements, we tend to focus heavily on frequency and regularity. Here, we switch gears and look at the role of a fundamental feature of language -social communication- on grammar acquisition.

We take as a case study Japanese particles acquired early in development, which can, roughly, be divided into two kinds: case markers that indicate the roles of words in a sentence, and sentence-final particles that indicate the emotion of the speaker. Both kinds of particles have similar frequencies in infant-directed-speech but SFPs tend to be used more irregularly (Najima, 2013). Nevertheless, SFPs, as a class, tend to be mastered earlier (Okubo, 1967). We hypothesize that SFPs may be mastered earlier because they may be more strongly tied to social-communicative function.

In a preregistered study, we investigate individual differences in gaze time to the eye-and-mouth region of the face of a speaker (a proxy for social-communicative awareness; Pons et al, 2019) and reported particle production scores (Japanese MCDI) in 20-22-month-olds (n=24) and 28-30-month-olds (n=24). Due to the current pandemic situation, we are to complete data collection in October 2021 (n=5). These results will strengthen our understanding of the cues young children may use to build up knowledge of grammar.

<https://bcccd.slack.com/archives/C02PHDS11RC>

**Session 11 [Friday, January 14,07:00 - 08:30 (UTC +0)]**

**Session 6 [Wednesday, January 12,13:00 - 14:30 (UTC +0)]**

**A-0116 Emotion Recognition in preterm and full-term school-age children**Letizia Della Longa<sup>1</sup>, Chiara Nosarti<sup>2</sup>, Teresa Farroni<sup>1</sup><sup>1</sup>Developmental Psychology and Socialization Department, University of Padova, Italy; <sup>2</sup>Department of Child and Adolescent Psychiatry, King's College London, UK

Preterm children are at risk for the emergence of early cognitive and emotional difficulties, which may lead to behavioral and psychiatric problems across adulthood. Accurate decoding of emotional signals from faces represents an essential prerequisite for socio-affective development and the formation of social bonds. This study aims to examine possible differences between preterm and full-term children in the ability to discriminate emotional facial expressions, investigating possible relationships between perceptual emotional processing and socio-emotional functioning during everyday activities. 55 school-age children (N=34 preterm, N=21 full-term) were presented with a cognitive assessment that ensured comparable cognitive abilities between the two groups (Raven's Progressive Matrices, Digit Span, Attention Network Task, Berg Card Sorting Test). Moreover, children were asked to identify emotional expressions from pictures of peer's faces (Emotion Recognition Task). Finally, children's socio-emotional and behavioral functioning was evaluated by using parent-reported questionnaires (Strengths and Difficulties Questionnaire, Emotion Regulation Checklist, Temperament in Middle Childhood Questionnaire, Behavioral Rating Inventory of Executive Function). The results revealed that preterm children were less accurate than full-term children in detecting emotional expressions, in particular in the case of positive emotions, and they showed an increased risk for social and behavioral problems. Notably, correlational analyses indicated a relationship between the ability to recognize emotional expressions and socio-emotional functioning. The present study points out that preterm children present a specific vulnerability in decoding emotional signals from faces, which may be critically link to emotional and behavioral regulation problems with cascading effects on the development of social skills and effective interpersonal interactions.

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**Session 10 [Thursday, January 13, 20:30 - 22:00 (UTC +0)]**

**Session 5 [Wednesday, January 12, 07:00 - 08:30 (UTC +0)]**

## **A-0117 Fast mapping, slow consolidation: How infants learn novel words through a dynamic social interaction**

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For early language development, it is critical for infants to be able to appropriately associate an auditory word with a certain object. Research has suggested infants encode semantic word-object associations with a very short presentation, but their retention is rather weak (Friedrich & Friederici, 2008). Yet, it has also been suggested the knowledge consolidation might only happen over time (Henderson, Weighall, & Gaskell, 2013; Friedrich et al., 2014). It is therefore possible to assume that infants can encode semantic information rapidly, but the consolidation only occurs with a delay during which the information is stored as long-term memory. The current study investigated the trajectory of semantic word-object association learning in 10- and 11-month-old infants, using a combination of ERP and EEG frequency analyses. Infants were presented with novel words and novel toys in a live interaction, and the encoding and retention of the word-object semantic associations were assessed. We found the evidence that infants encoded semantic information during the live presentation as indexed by upper alpha band activity (9-10Hz), and that the evidence of semantic knowledge was only observed after 24h delay, not immediately after the presentation. Importantly, individual differences were observed in terms of the attentional engagement with the presentation, which affected the degree of knowledge consolidation. The study provides evidence to support the fast mapping but slow consolidation of word-object links (Friedrich & Friederici, 2008; Friedrich et al., 2014), and further demonstrates the neural processes of semantic word learning during infancy that unfolds over a few days.

<https://bcccd.slack.com/archives/C02PQ4W2XC2>

**Session 1 [Monday, January 10, 20:30 - 22:00 (UTC +0)]**

**Session 6 [Wednesday, January 12, 13:00 - 14:30 (UTC +0)]**

## **A-0118 Validation of Body Posture as a Novel Measure of Emotion in Early Childhood**

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Examining children's emotions can illuminate their cognitive (Beck & Riggs, 2014), and socio-moral development (Vaish et al., 2009). Yet, emotional expressions are often fleeting and occur in dynamic social contexts rendering them difficult to measure objectively 'in the moment'. Here, we present the results of a validation study in which we show that changes in children's upper body posture, recorded automatically using a motion depth sensor imaging camera (the Microsoft Kinect), reflect systematic changes in children's emotion valence. To this end, we coded the emotional expression of  $N = 466$  children ( $M_{age} = 5.08$ , age range: 2.41-6.17), who had participated in six studies in our laboratory. In each study, children's body posture was recorded after an experimental manipulation. Results showed a positive association between children's change in upper body posture with children's emotion valence assessed by adult coders,  $b = 0.41$ ,  $SE = 0.2$ ,  $t(461) = 2.05$ ,  $p = .04$ . This result was similar after correcting children's change in upper body posture the change in children's lower body posture,  $b = 0.59$ ,  $SE = 0.19$ ,  $t(461) = 3.11$ ,  $p = .002$ . Crucially, there was no association of emotion valence with changes in children's lower body posture. These results show, in a representative sample of children, that changes in children's upper body, but not lower body posture reliably indicate the valence of children's emotional expression. Thus, assessing children's body posture using motion depth sensor imaging is a useful scientific method to address questions about children's cognitive, emotional, and socio-moral development.

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**Session 2 [Tuesday, January 11, 07:00 - 08:30 (UTC +0)]**

**Session 9 [Thursday, January 13, 13:00 - 14:30 (UTC +0)]**

## **A-0119 Mothers' descriptions of referents predict children's communicative success**

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When describing entities for a listener, young children tend to produce ambiguous initial descriptions and need several attempts to convey the intended message. Since caregiver-child interactions frequently involve the exchange of referents, caregivers' descriptions of referents may provide guidance and serve as models for children. There is yet no study investigating how children's referential communication skills relate to the referential input they receive from their caregivers. In this study examining this relationship, fifty-four children ( $M(SD)=56.6(6.9)$  months) participated in two sessions one week apart. In the first session, mother-child dyads participated in a game where the speaker described target pictures so that the listener could locate those among similar distractors. The speaker role was assigned to children first and mothers later. In the second session, children's ability to describe target pictures among similar competitors to the experimenter was assessed with an online task. For both mothers and children, the clarity of their initial descriptions (i.e. unique/ambiguous) and the number of attempts they needed to describe a picture were coded. Controlling for children's success in describing pictures for their mothers, mixed-effects regression analyses showed that children formed clear initial descriptions (Estimate=1.23, SE=.60,  $p=.004$ ) and needed fewer description attempts (Estimate=-.21, SE=.08,  $p=.02$ ) if their mothers produced unambiguous initial descriptions when talking to their children. Furthermore, children needed fewer description attempts if their mothers described pictures in fewer attempts as well (Estimate=.23, SE=.11,  $p=.004$ ). These findings suggest that mothers' referential descriptions serve as models for young children's developing referential communication skills.

<https://bcccd.slack.com/archives/C02PM6V6Z0D>

**Session 5 [Wednesday, January 12, 07:00 - 08:30 (UTC +0)]**

**Session 3 [Tuesday, January 11, 13:00 - 14:30 (UTC +0)]**



## **A-0120 You can't see me now! - Testing the role of gaze in reputation management at an early age**

Réka Schvajda<sup>1,2</sup>, Ildikó Király<sup>3</sup>

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As humans we are constantly in a social environment. Adults and children alike tend to be more generous if someone observes them and according to the watching eyes-effect the eyes could play a special role in this process. Recent research confirmed that children were more generous when they were exposed to a pair of open eyes, rather than a neutral picture (Kelsey et al., 2018). However, when children were exposed to a different cue (mouth), the results were ambiguous. The behavioral uncertainty of children could be the result of the ambiguity of the mouth as a social cue: it could signal an observer's presence, or it could indicate that an agent is watching, but with uncertainty. Our goal was to replicate the study of Kelsey and colleagues (2018) offline and online as well, and also disentangle the source of the ambiguity in their results. We tested children with the presentation of a pair of closed eyes to grasp the effect of the presence of non-watching agent per se. After the training phase children participated in a resource-allocation task while being exposed to a pair of open or closed eyes or to a neutral picture (flowers). If the mere presence of another person triggers prosocial behaviour, children would distribute resources in the presence of closed and open eyes alike. However if open eyes and being seen plays a special role in situations where others could evaluate us, children will behave differently in the presence of the two types of eyes.

<https://bcccd.slack.com/archives/C02PM6S7LP7>

**Session 7 [Wednesday, January 12, 20:30 - 22:00 (UTC +0)]**

**Session 2 [Tuesday, January 11, 07:00 - 08:30 (UTC +0)]**

## **A-0126 Effects of Two Linguistic Interventions on Three-Year-Olds' Early Mental State Reasoning Abilities**

Larissa J. Kaltefleiter, Susanne Kristen-Antonow, Tobias Schuwerk, Beate Sodian  
Ludwig-Maximilians-Universität München, Germany

While it is well-known that language skills play an important role in children's acquisition of a Theory of Mind (Milligan et al., 2007), there is an ongoing debate which aspect of language is particularly relevant. Some researchers argue that children's acquisition of mental state terms (Olson, 1988) and their exposure to conversations highlighting different perspectives (Harris, 2005) drive their Theory of Mind development. Others emphasize complement syntax competence as a mechanism for understanding others' mental states (de Villiers & de Villiers, 2009). Moreover, recent findings of early mental state reasoning abilities below the age of three (Harris et al., 2017; Setoh et al., 2016) have brought attention to the third year of life as an important time in children's Theory of Mind development. Within the present study of N = 175 children, we contrasted the effectiveness of two different linguistic trainings – mental state language and complement syntax training – on 36-month-olds' early Theory of Mind abilities in comparison with an untrained control group. Children's participation in the mental state language training led to significantly stronger improvements in seeing-knowing tasks than in the control or complement syntax group. The mental state language training also affected improvement in a metacognition task but not in visual and epistemic perspective-taking tasks. The complement syntax training only tended to affect improvement in epistemic perspective-taking. The observed effects of a linguistic intervention on mental state reasoning abilities indicate that already young three-year-olds' language abilities underlie and support the development of early Theory of Mind abilities.

**<https://bcccd.slack.com/archives/C02QDS3CX9N>**

**Session 4 [Tuesday, January 11, 20:30 - 22:00 (UTC +0)]**

**Session 5 [Wednesday, January 12, 07:00 - 08:30 (UTC +0)]**

**A-0127 The rhythm of touch enhances infants' attention towards complex visual scenes**

Laura Carnevali, Letizia Della Longa, Teresa Farroni

Department of Developmental Psychology and Socialization, University of Padua, Italy

From the earliest ages, infants' social environment is enriched by a variety of sensory rhythms that influence their attentional system helping them tuning to complex scenes. Of all the senses, affective touch directly connects the self with the others and vehiculates affective-motivational meanings, contributing to the acquisition of body awareness and fostering social learning. Crucially, when tactile stimulation is shared, the sense of affiliation and similarity among interacting children is enhanced, further influencing their social attitude. However, the developmental origin of this effect is poorly explored. In the present online study, we investigate whether 6- to 11-month-old (N=42) infants' attention towards actions performed by a character is modulated by previous sharing of affective touch with the same character. Following a sequential familiarization with two characters respectively matched with tactile (affective or non-affective) and auditory stimulation, infants were presented with scenes in which the characters moved toward objects and, eventually, they underwent a visual preference test in which the two objects were displayed side by side.

Our results showed that infants looked longer to the character when sound is provided ( $t = -4.15$ ,  $p < .001$ ), whilst during scenes presentation infants that previously experienced affective (vs non affective) touch looked longer to the whole scene ( $t = -2.20$ ,  $p = .034$ ). These findings suggest infants' attention to be differentially influenced by sound and touch. Specifically, sound seems to act as attention getter while the rhythm of caress-like touch might predispose the organism to explore a more complex environment presented after the stimulation itself.

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**Session 4 [Tuesday, January 11, 20:30 - 22:00 (UTC +0)]**

**Session 5 [Wednesday, January 12, 07:00 - 08:30 (UTC +0)]**

**A-0128 14-month-olds' attribution of information-seeking goals**

Bálint Varga, Gergely Csibra, Ágnes Melinda Kovács

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Although infants can frequently observe others gathering information, it is an open question whether and how they make sense of such activities since both the mental causes and intended effects of these are hidden and underdetermined by evidence. On the other hand, since such behaviors provide a unique window into other agents' epistemic states, particularly their gaps in knowledge, it seems advantageous for social organisms to develop interpretative capacities towards them, at least for the purposes of competition, exploitation, or cooperation. We tested the hypothesis that infants attribute information-seeking goals to agents' actions when these actions could reduce the agents' uncertainty regarding particular variables of the context that are relevant for reaching their instrumental goals. In two experiments, we presented 14-month-old infants with actions that were inefficient with respect to the observed agent's instrumental goal but could or could not be justified as well-formed information-seeking behavior. We expected longer looks in the latter condition and our results were in line with our predictions: infants looked more both when the behavior was unjustifiable because the agent was already knowledgeable of the relevant facts (Experiment 1) and when the action couldn't possibly yield relevant information (Experiment 2), compared to the condition where the agent was uncertain, making the same action justifiable as information-gathering. In Experiment 3 (currently in progress), we further assess the role that attributed uncertainty over possible environmental states plays in infants' evaluation of others' information-seeking actions.

<https://bcccd.slack.com/archives/C02PHDYN4J2>

**Session 10 [Thursday, January 13, 20:30 - 22:00 (UTC +0)]**

**Session 2 [Tuesday, January 11, 07:00 - 08:30 (UTC +0)]**

**A-0129 Third-party punishment for bystanders by children.**Ayaka Ikeda<sup>1</sup>, Yuko Okumura<sup>1</sup><sup>1</sup>Senshu University, Kanagawa, Japan; <sup>2</sup>NTT Communication Science Laboratories, Kyoto, Japan

Bystanders are sometimes criticized or punished for doing nothing. Although Plötner et al. (2015) revealed that 5-year-old children show the bystander effect, it is unclear how children evaluate bystanders. This study examined whether children engage in third-party punishment to bystanders and if their evaluation of the bystander changes as they grow.

Forty-eight children aged 3- to 8-years participated in the experiment; they were divided into younger and older groups. In the task, the children were shown a movie in which a victim is deprived of their toy by a wrongdoer, and a bystander watches what is happening without intervening. After watching the movie, the children were provided an opportunity to punish the characters by reducing the number of cookies planned to be distributed to the victim, bystander, and wrongdoer. The children were also asked to indicate whether they perceived the character's behavior as good or bad on a 5-point Likert scale.

Results revealed that older and younger children reduced the highest number of cookies from the wrongdoer, followed by the bystander and then, the victim. This means that both older and younger children punished the bystander, although the punishment for the bystander was lower than for the wrongdoer; however, the degree of punishment was higher in older children than younger children. Additionally, their good-and-evil judgments did not predict the degree of punishment determined for the bystander. These results suggest that children's age affects the degree of third-party punishment to the bystander irrespective of their evaluation of good and evil.

<https://bcccd.slack.com/archives/C02PHE18K6J>

**Session 5 [Wednesday, January 12, 07:00 - 08:30 (UTC +0)]**

**Session 9 [Thursday, January 13, 13:00 - 14:30 (UTC +0)]**

## **A-0130 Planning instrumental and epistemic actions across development - An online study**

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Goal-directed action usually refers to pursuing outcomes of expected external value. However, humans also assign value to the information they can gain from the world, and interact with their environment motivated by opportunities for learning – a motivation often termed curiosity. It has been suggested that the level of action and attention modulation by curiosity gradually decreases from infancy to adulthood, but also varies as a function of individual cognitive skills (especially inhibition) and more stable dispositions towards uncertainty. In our study, we aimed to capture the real-time process of planning instrumental and epistemic actions across development, and examine how it can be predicted by individual differences. We examined how 5-7 year-olds, 13-15 year-olds and adults chose between different options to interact with, when these options led either to the attainment of a rewarding goal, to new knowledge or to novel experiences. We examined how the competition between these options was reflected in the real-time action plans; i.e., at the specific hand kinematics while participants made their choices, as we expected an implicit modulation of movement by curiosity in the younger group even when their final choices differed. Participants completed an online decision-making task as we tracked mouse positions, a stimulus-preference task with varying levels of uncertainty and standard executive functions tasks. Preliminary results suggest a positive correlation between uncertainty preferences and participants' curiosity choices. Furthermore, temporal parameters of hand kinematics showed greater confidence in action plans leading to external rewards in adults. Further analyses are required to reach conclusions.

**<https://bcccd.slack.com/archives/C02SUPASFUL>**

**Session 7 [Wednesday, January 12, 20:30 - 22:00 (UTC +0)]**

**Session 6 [Wednesday, January 12, 13:00 - 14:30 (UTC +0)]**

**A-0131 Infants' emotion recognition and preference for happiness**

Liat Israeli-Ran, Florina Uzefovsky

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The ability to recognize and understand others' emotions is an early-developing basic social ability which predicts important child outcomes such as higher prosocial behavior and lower behavior problems. Research in adults shows that they tend to recognize happy expressions faster and with higher accuracy than other types of emotions, but it is unclear whether this is the case for infants. Therefore, the goal of the current study was to investigate the characteristics of emotion recognition of happy and sad facial expressions in infants. Differences in recognition between positive and negative emotions during infancy. Data were collected from May to August 2020 from 138 infants (age:  $M = 13.6 \pm 2.43$  months, 47% female). The infants performed a cross-modal emotion recognition task. In this task, two images of a woman expressing an emotion (happy/sad/neutral) are shown and accompanied by a vocal expression of emotion, corresponding to one of the facial expressions (laughing / crying) for 10 seconds. The dependent variable is looking-time at the congruent picture. The mean %looking-time to the congruent picture (typically interpreted as a sign of emotion recognition) was significantly longer ( $t(137)=5.83, p=.000$ , congruent:  $M = 0.44 \pm 0.053$ , incongruent:  $M = 0.39 \pm 0.05$ ). Additionally, looking-time to the positive congruent picture is significantly longer ( $t(137)=5.82, p=.000$ , positive:  $M = 0.47 \pm 0.09$ , negative:  $M = 0.41 \pm 0.08$ ). Although infants recognize positive and negative emotions well, they tend to look longer at happy expressions. It may indicate that recognizing positive emotions is a more positive experience or is easier.

<https://bcccd.slack.com/archives/C02P9FT6S7R>

**Session 4 [Tuesday, January 11, 20:30 - 22:00 (UTC +0)]**

**Session 8 [Thursday, January 13, 07:00 - 08:30 (UTC +0)]**

## **A-0132 Temporal regularities in the environment and the intrinsic timescales of cognitive systems: which comes first?**

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Anna Truzzi, Rhodri Cusack

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Events in the environment have distinct characteristic timescales. Each cognitive system needs to be tuned to the appropriate timescale in order to extract from the sensory stream the information relevant for cognitive development and learning. Neuroimaging studies in adults have found that each brain region has a characteristic intrinsic timescale over which it integrates information. However, we do not yet know if the timescales in the brain emerge as a consequence of learning the statistics from the environment or whether, on the contrary, the development of brain timescales precedes the learning process and drives and shapes it. We investigated intrinsic timescales in neonates shortly after birth. We characterised the timescales using an autoregressive model from resting-state fMRI data in low-movement neonates from the developing human connectome project (dHCP, N\_infant=267) and low-movement adults from the CamCAN project (N\_adult=252). The timescales in the neonates significantly differed by brain area and the difference was reliable across infants. Structure is therefore already present shortly after birth. Variation within some brain networks was similar between adults and infants, but the timescale distribution differed in that infants had overall slower timescales than adults. These longer timescales, especially in sensory areas, could be linked to lack of pruning and myelination. This characteristic might lead the infant to learn slower changing statistics and favour the emergence of more holistic cognitive representations less binded to little perceptual details. During development, the brain could then differentiate its tuning properties to match a variety of events with different statistics.

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**Session 4 [Tuesday, January 11, 20:30 - 22:00 (UTC +0)]**

**Session 9 [Thursday, January 13, 13:00 - 14:30 (UTC +0)]**



## **A-0133 Do communicative signals during joint attention promote mutual neural processes?**

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Communicative signals such as eye contact have been shown to increase infants' brain activation in response to visual stimuli (Hoehl et al., 2014) and considered to promote shared attention in early development (Siposova & Carpenter, 2019). In this study, we assessed whether communicative signals during joint attention enhance mother-infant dyads' mutual neural processes due to a higher level of attention alignment. Applying the method of steady-state visually evoked potentials (SSVEPs) in a dual electroencephalography (EEG) paradigm, we measured the brain activity of 11-12-month-old infants (n=50) and their mothers simultaneously. Specifically, we assessed infants' and mothers' SSVEPs and their associations to rhythmic visual stimuli in order to quantify mutual neural processes during two conditions: joint attention (JA) with communicative signals and mutual reference (eye contact, pointing, infant-directed speech) vs joint watching without communication or mutual reference. To track mutual visual processing, we presented images flickered in 4 Hz depicting natural objects in front of a background. Flickering images elicit SSVEPs at 4 Hz that can be measured with EEG (Köster et al., 2017), allowing to assess dynamic changes in shared attention within the dyad. Between conditions, we manipulated communicative signals by instructing the mother to either establish mutual gaze with the infant, comment on and point to the images or watch the images without communicative engagement. Our preliminary results revealed that communicative signals during joint attention enhanced infants' visual processing in comparison with joint watching, shedding light on how communicative engagement modulates infants' brain activity and shapes visual experience.

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**Session 1 [Monday, January 10, 20:30 - 22:00 (UTC +0)]**

**Session 9 [Thursday, January 13, 13:00 - 14:30 (UTC +0)]**

## **A-0134 Perception of social relations in the first two years of life**

Goupil, Hochmann, Papeo

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In infants, like in adults, two face-to-face bodies are automatically grouped in a single percept and processed more rapidly than two back-to-back bodies. Whether infants can represent that face-to-face –but not back-to-back – bodies imply social relationship remains unknown.

We tested infants of different ages, to form two groups: <1 year (7-10 months; N=40) and >1 year (15-18 months, N=27). Using eye tracking, we measured the difference in looking times between a face-to-face and a back-to-back dyad, appearing together on a screen. Differential looking times, taken as measure of processing times, showed that younger infants processed face-to-face bodies faster than back-to-back bodies, replicating previous results. In addition, we measured the switch rate during fixation, i.e. how fast/often infants switched from one body to the other in face-to-face and in back-to-back dyads, under the hypothesis that switching increases when two bodies are represented in a relationship. While switching was comparable for face-to-face and back-to-back dyads in younger infants, older infants showed a significant increase of switching for facing, relative to non-facing bodies. This effect occurred while the looking time difference between face-to-face and back-to-back bodies disappeared.

These preliminary results suggest that the representation of social relationship in infancy involves a first developmental stage, in which infants detect perceptual (i.e., visuospatial) differences between scenes with different social content (face-to-face vs. back-to-back positioning), and a second stage, in which infants may capture the different content implied by body positioning (relationship for face-to-face, absence of relationship for back-to-back) people.

**<https://bcccd.slack.com/archives/C02PM6WT8ER>**

**Session 1 [Monday, January 10,20:30 - 22:00 (UTC +0)]**

**Session 5 [Wednesday, January 12,07:00 - 08:30 (UTC +0)]**

## **A-0137 Theory of Mind in Action: Training Different Theory-of-mind Components to Improve Children's Strategic Lying**

Shi-Wei Ong, Xiao Pan Ding

National University of Singapore, Singapore

When multiple parties' interests are involved, it is common to tell strategic lies to maximise self-gain (Bălău & Utz, 2016; Cartwright, 2011). The emergence of strategic lying signifies an advancement in children's socio-cognitive ability. Previous studies found that training children's false-belief and knowledge-access understanding can lead them to tell strategic lies (Ding et al., 2015; Sachiman, 2019). However, there is an inherent rationale that diverse-beliefs understanding could also serve the same purpose. Strategic lying requires the understanding that others can hold beliefs that contrast with the self, hence others can be led to have a wrong belief if one is holding the truth. The present study aims to compare the effects of the three theory-of-mind components – diverse beliefs, knowledge access, and false belief – on promoting children's strategic-lying ability. Three-year-old children (N = 108) were assigned to either the diverse-beliefs, knowledge-access, or false-belief training condition based on their prior theory-of-mind competence. Strategic lying was measured with a zero-sum game. The effect of theory-of-mind training was evaluated with the difference between children's strategic-lying ability in the pre- and post-zero-sum game. Results revealed that children who could not lie in the zero-sum game initially began to do so after the theory-of-mind training. However, the three groups did not differ significantly in improving strategic lying. Future studies could include a control condition (e.g., train conservation rules) to contrast with the theory-of-mind training groups. The current findings afford important insights into the role of theory of mind in promoting children's strategic behaviour.

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**Session 5 [Wednesday, January 12, 07:00 - 08:30 (UTC +0)]**

**Session 12 [Friday, January 14, 13:00 - 14:30 (UTC +0)]**

## **A-0138 Maternal responsiveness to infant distress: A cross-cultural comparison between Uganda and the UK**

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The manner in which caregivers respond towards their infant's emotional states is a key predictor of infant socioemotional development, including emotion regulation and empathy. It also plays a crucial role in early emotion socialisation, which is considered to vary across cultures. Nevertheless, research examining this cross-cultural variability and the extent of culturally specific developmental outcomes remains limited. In this study, we addressed this by examining caregiving responses to infant distress in a sample of Ugandan and UK mother-infant dyads. We conducted naturalistic video-focal observations of N = 47 6-month-old infants and their mothers from rural Uganda (N = 21) and urban England (N = 26). We assessed maternal responsiveness to spontaneous infant distress, their empathic comforting strategies, and whether these predicted infants' emotion regulation as indicated by speed of recovery from distress. Preliminary results indicate that maternal responsiveness, as indicated by maternal latency to respond to infant distress, did not substantially differ between our Ugandan and UK samples. However, there was cross-cultural variation in maternal comforting strategies regarding the degree of physical engagement and the nature of verbal engagement. Despite these differences, infants' speed of recovery from distress was better predicted by maternal latency to respond rather than comforting style, suggesting that despite cultural variability in maternal responding, the speed of maternal responsiveness itself may be the more crucial factor for successful infant emotion regulation.

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**Session 4 [Tuesday, January 11, 20:30 - 22:00 (UTC +0)]**

**Session 9 [Thursday, January 13, 13:00 - 14:30 (UTC +0)]**

**A-0139 Children can infer deceptive intent from indirect information**

Nina Ni Ye, Xiao Pan Ding

National University of Singapore, Singapore

Children rely on others to acquire knowledge as part of cumulative culture. However, this brings about the risk of trusting false or deceptive information blindly. Previous research suggests that young children can differentiate between honest and deceitful informants when presented with direct evidence of deceit (e.g., Liu et al., 2013; Mascaro & Sperber, 2009; Vanderbilt et al., 2011). The present research investigated 3- to 6-year-old children's (N = 33) use of indirect information to infer deceptive intent and examined their ability to extend such inference from a near-transfer location context to a far-transfer naming context. Children learned how to play a sticker-finding game then watched videos of four informants play the same game with an opponent. They inferred the informants' deceptive intent from the opponent's testimony and the game outcome, presented together to reflect honest (trust-win, distrust-lose) or deceptive intent (trust-lose, distrust-win). We assessed whether children endorsed or rejected an informant's suggestion about an object's location (near-transfer context) and name (far-transfer context). Preliminary results showed, in the near-transfer context, children endorsed an informant based on honest-intent information (trust-win, distrust-lose) and rejected another based on deceptive-intent information (trust-lose, distrust-win). However, in the far-transfer context, children endorsed an informant based on either positive testimony (trust) or outcome (win), suggesting an inability to extend their inference of deceptive intent to another context. Our study provides evidence for children's developing critical reasoning abilities when inferring deceptive intent and point to the perception of deceptive motives as a comment on an informant's general reliability.

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**Session 2 [Tuesday, January 11, 07:00 - 08:30 (UTC +0)]**

**Session 12 [Friday, January 14, 13:00 - 14:30 (UTC +0)]**

## **A-0141 Pragmatics, mind-reading and nativism: a plea for the modular view**

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Cognitive approaches to human communication argue that verbal comprehension strongly relies on mind-reading. Relevance Theory (RT) elaborates this view in a modular description of the mind, by positing the existence of a pragmatic module conceived as a sub-module of the overall mind-reading module (Sperber & Wilson, 2002). Notably, RT describes the pragmatic module as being uniquely responsive to ostensive stimuli (e.g., utterances, pointing gestures) and specifically tailored to the recognition of communicative intentions behind them.

Recently, the modular view of pragmatics has been questioned, both theoretically and empirically. Some critics object that RT endorses a trivial notion of modularity (Mazzone, 2018), others contend that empirical data from clinical research undermine the supposed overlap between pragmatics and MR (Kissine, 2016).

In this paper, I address the issue from a developmental perspective. Firstly, I suggest focusing on research demonstrating that infants are biased towards ostensive and communicative signals well before they acquire a full-fledged language (e.g., Csibra, 2010), thus supporting the idea of an innate mechanism for the tracking of communicative intentions.

Secondly, I propose to spell out RT's loose claims about the steady involvement of metarepresentational abilities in verbal comprehension by focusing on studies that investigate infants' implicit dispositions to be biased by others' mental states (e.g., Kovács et al., 2021).

Finally, I provide a theoretical framework that reconciles data on early metarepresentational skills with studies on infants' sensitivity to ostensive signals, thus supporting the hypothesis of a pragmatic module dedicated to mind-reading in intentional communication.

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**Session 2 [Tuesday, January 11, 07:00 - 08:30 (UTC +0)]**

**Session 12 [Friday, January 14, 13:00 - 14:30 (UTC +0)]**

## **A-0142 Developmental changes in mentalization abilities across the Lifespan and in Developmental Language Disorder**

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The Social Attribution Task – Multiple Choice (SAT-MC; Johannesen et al., 2013) aims to measure mental state attribution with minimizing reliance on other cognitive mechanisms, and preventing reliance on prior knowledge and explicit strategies. In this test, different movements of geometric shapes are shown (based on Heider and Simmel, 1944), followed by a questionnaire that tests implicit social attribution capacities.

To explore the change of mentalization abilities in different ages, we collected data with the SAT-MC-II in five age groups: children, adolescents, young adults, middle age adults and old adults. In our second experiment, we compared mentalization abilities of children with Developmental Language Disorder (DLD; n=18) to typically developing peers (n=18), matched individually on age and sex. In line with previous studies, young adults outperformed children and elder adults as well, while the youngest and oldest participants did not differ significantly. The comparison of children with and without DLD did not show significant difference.

The gradual development and gradual decline through age groups and the great individual variability within the groups imply that SAT-MC is a sensitive tool for measuring both individual and group differences in mentalizing. Since neither verbal nor facial processing is needed to interpret the video, and compensation strategies cannot be applied, the task provides reliable index of mentalizing. The comparison of children with and without DLD revealed no evidence for a mentalization impairment in DLD. This raises the question whether in studies relying on false belief attribution tasks, mentalizing abilities of children with DLD might be masked by language.

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**Session 7 [Wednesday, January 12, 20:30 - 22:00 (UTC +0)]**

**Session 2 [Tuesday, January 11, 07:00 - 08:30 (UTC +0)]**

## **A-0143 Relationship between explicit synchronised movement, generosity and perceived similarity**

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Research shown that synchronous movement between individuals can heighten feelings of prosociality and similarity. However, research using virtually-induced synchrony with children has not been studied. The current study explored the effect of virtually-induced motor synchrony, on generosity and perceived similarity in children. The study used a 3x2x2 between-subjects design, IV [synchrony conditions (3), gender (2), year group (2)] and two DV [generosity and perceived similarity]. 82, 4.5-6.5-year-olds participated. Children tapped along on a drum with either a same sex virtual peer bouncing a ball in a movie, or a ball bouncing on its own. In a control condition, children watched a tiger playing and then drew a picture. Generosity was measured using a toy distribution, a task in which the children had to allocate toys to themselves and the virtual peer (Rabinowitch & Meltzoff, 2017) Perceived Similarity was established based using on Rabinowitch and Knafo-Noam's (2014) similarity inventory. Results showed no significant effects of gender, age or condition on either generosity or perceived similarity. However, planned post-hoc tests revealed that children in the social synchrony condition reported higher perceived similarity to their virtual peer than those in the non-social synchrony condition  $t(54)=2.230, p<.03$ . Pairwise comparison showed younger children scored higher levels of similarity  $F(1,70)=6.632, p<.012$ . Furthermore, results showed that virtually induced synchrony is not as useful in altering the generosity choice of young children. More interestingly, results indicated that children felt more similar to an unfamiliar peer following conscious movement synchrony.

<https://bcccd.slack.com/archives/C02QDS62V6U>

**Session 4 [Tuesday, January 11, 20:30 - 22:00 (UTC +0)]**

**Session 6 [Wednesday, January 12, 13:00 - 14:30 (UTC +0)]**



## A-0145 Children's Learning of Non-Adjacent Dependencies Using a Web-Based Computer Game Setting

Mireia Marimon<sup>1</sup>, Andrea Hofmann<sup>1</sup>, João Veríssimo<sup>1,2</sup>, Claudia Männel<sup>3,4</sup>, Angela D. Friederici<sup>3</sup>, Barbara Höhle<sup>1</sup>, Isabell Wartenburger<sup>1</sup>

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To acquire their native language, infants must learn the relations between the individual words, known as non-adjacent dependencies (NADs, e.g., is singing). NADs consist of statistically reliable relationships between two elements separated by intervening elements. Infants seem to learn NADs implicitly through passive listening and there is evidence for a shift from associative learning to more controlled learning of NADs after 2 years of age (van der Kant et al., 2020), potentially driven by the maturation of the prefrontal cortex. Lammertink et al. (2019) showed in a Serial Reaction Time task that 6- to 11-year-old children learned the NADs, as their reaction times increased when presented with violated NADs. In the current study we adapted their experimental paradigm and tested NAD learning in 4- to 8-year-olds in a web-based game-like setting. Children were exposed to Italian NAD phrases and had to monitor a target syllable (ando or are), which was the second element of the NAD. After exposure, children performed a "Stem Completion" task in which they were presented with the first element of the NAD and had to select the second element of the NAD. Our findings show that, despite large data variability, 4- to 8-year-olds are sensitive to NADs. On average, children show the expected differences in reaction times in the Serial Reaction Time task and transferred the NAD-rule in the Stem Completion task. We discuss these results with respect to the development of NAD learning in childhood and the practical impact of web-based data collection.

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**Session 4 [Tuesday, January 11, 20:30 - 22:00 (UTC +0)]**

**Session 11 [Friday, January 14, 07:00 - 08:30 (UTC +0)]**

## **A-0146 Why is that toy on the table? - Investigating the role of prior learning context on subsequent knowledge attribution**

Rebeka Zsoldos<sup>1</sup>, Réka Schvajda<sup>1</sup>, Ildikó Király<sup>1,2</sup>

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Natural pedagogy theory (Csibra & Gergely, 2009) posits that infants interpret communication directed at them as conveying information that is kind-relevant and generalizable. The present study investigates further whether children apply the principle of universality in knowledge attribution selectively following them being exposed to ostensive learning context or not. A set of novel tools are introduced to three-year-old children by an experimenter (E). They also get to know a protagonist (P), who then leaves the scene to search outside for the pair of the tool. While P is outside the room, children are watching E using the original tool with two props in different ways: E both explore the use of the tool with no communicative cues (non-generic prop) and also communicatively demonstrate to the child how to use it with another prop (generic prop). Then, P reenters the scene with the pair of the novel tool and asks for a prop ambiguously while showing either happiness (“Good! This toy is out already!”) or surprise (“Ooh, why is that toy here?”). We record how children answer the request. We expect children to give the generic prop to the protagonist when she is happy and the non-generic one when she is surprised. This pattern of result would allow us to assume that children apply the universality principle following their learning in an ostensive communicative context to attribute knowledge and disambiguate the communicative referential requests of their partners.

<https://bcccd.slack.com/archives/C02PQ4Z6S0J>

**Session 4 [Tuesday, January 11, 20:30 - 22:00 (UTC +0)]**

**Session 8 [Thursday, January 13, 07:00 - 08:30 (UTC +0)]**

**A-0147 Children use Altruism to Identify Parent-Child Relationships**

Anna Michelle McPhee, Sinamys Bagh, Mark A. Schmuckler, Jessica A. Sommerville  
University of Toronto, Toronto, Canada

Navigating our social worlds requires us not only to be able to detect who we are affiliated with, but also to identify third-party social affiliations. While this ability appears to develop in early childhood, it is currently unknown when and how children are able to identify specific types of third-party social affiliations, such as parent-child relationships. The purpose of the current study was to explore the developmental trajectory of children's ability to identify third-party parent-child relationships, and to explore whether a key behavioral output of first-person kinship detection, altruism, may be a valuable cue to aid in this process. Three- to five-year-old children ( $n = 97$ ) were presented with hypothetical vignettes depicting interactions between an adult and child character with the presence of altruistic behavior and the type of relationship present manipulated across situational contexts. Participants were asked forced-choice questions about the scenarios, including questions about the type of relationship present, the characters' anticipated behavior, their anticipated emotional reactions, and evaluations of the characters. Children as young as 3-years-old used the observation of altruistic behavior to infer parent-child relationships ( $p < 0.001$ ), used knowledge of parent-child relationships to anticipate altruistic behavior ( $p = 0.006$ ), and varied their anticipated emotional reactions ( $p = 0.02$ ) and evaluations ( $p = 0.03$ ) as a function of relationship type. The results suggest that the ability to identify third-party parent-child relationships develops in the preschool years and that key behavioral outputs of first-person kinship detection act as valuable cues to aid in this feat.

<https://bcccd.slack.com/archives/C02P9HWB7AB>

**Session 4 [Tuesday, January 11, 20:30 - 22:00 (UTC +0)]**

**Session 6 [Wednesday, January 12, 13:00 - 14:30 (UTC +0)]**

## **A-0148 I want to know about my train! Factors Driving Children's Motivation to Learn about Individuals**

Otávio Mattos<sup>1</sup>, Cristina-Ioana Galusca<sup>2</sup>, Kelsey Lucca<sup>3</sup>

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Past research has shown that children are more likely to seek out and remember facts about kinds (e.g. “tarsiers hunt for birds”) than individuals (e.g. “this tarsier likes to sing”; Cimpian, 2016), underscoring the importance of kind-based information in human cognition. However, children also often care about and learn facts about individuals. What are, then, the circumstances that increase interest in specific facts? Here, we explored whether ownership, familiarity, and entity type influence children's decision to learn information about individuals over kinds. Specifically, we asked 4- to 5-year-olds whether they wanted to learn new information about a specific item, or about that item's kind, varying the item's ownership status (owned by the child, an experimenter, or nobody), familiarity (a familiar or a novel kind), and entity type (animal or artefact) across trials. Children preferred to learn specific facts about individual items rather than their kinds when (1) the items were owned by children, or (2) the items were familiar artefacts. This study is the first to reveal factors that motivate children to learn about individuals, laying the groundwork for future research on the circumstances that drive children's learning preferences more broadly.

<https://bcccd.slack.com/archives/C02PM6WL2RK>

**Session 7 [Wednesday, January 12, 20:30 - 22:00 (UTC +0)]**

**Session 8 [Thursday, January 13, 07:00 - 08:30 (UTC +0)]**

**A-0150 Infants' use of Partiality as a cue for Kinship Detection**

Anna Michelle McPhee, Simran K. Badalera, Sinamys Bagh, Mark A. Schmuckler, Jessica A. Sommerville

University of Toronto, Toronto, Canada

Previous research in our lab found that children as young as 5-years-old use partiality as a cue to infer third-party parent-child relationships, with evidence that this ability emerges across the preschool period. It is currently unknown whether children's implicit abilities emerge earlier. The present study investigated whether 12- to 24-month-old infants use partiality as a cue to infer third-party parent-child relationships. Participants ( $n = 30$ ; only a subset of data has been collected) were shown four animated familiarization trials of an adult distributing resources either partially (3:1 ratio; experimental) or impartially (2:2 ratio; control) to two babies. On test, participants were shown a display in which an occlusion covered the babies. Next, participants heard one of the babies call out, "Mama". Participants' anticipatory looking was recorded and used as an indicator as to which of the two babies the participants expected the adult to comfort. In the experimental condition, 79% of participants displayed anticipatory looking, with 84% of them anticipating that the adult would attend to the baby given the advantageous distribution (with responses significantly above chance;  $p = 0.004$ ). These findings illustrate the fundamental role social cues play in infants' implicit kinship detection abilities.

<https://bcccd.slack.com/archives/C02PSCV4JUJ>

**Session 1 [Monday, January 10, 20:30 - 22:00 (UTC +0)]**

**Session 12 [Friday, January 14, 13:00 - 14:30 (UTC +0)]**

## **A-0151 Selective attention modulation of audiovisual world learning**

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While most studies have explored word learning in highly simplified settings, infants' more usual experience involves rather complex face-to-face audiovisual environments. This suggests that infants' attention development is crucial for selecting the relevant information from a talker's face—both social and speech cues—to learn novel word-object associations. In the present study we explore the relationship between 20-month-olds selective attention to a talker's eyes and mouth, their gaze-following ability and their word learning performance. To do so, we analysed infants' eye gaze while performing an audiovisual word learning task. During the learning phase, a speaker looks at one of two objects (head-turn) and then names it three times (object-naming). Then, at test, two objects are presented side by side while the voice of the speaker asks for one of them. Findings from the first 15 participants showed that, during the head-turn, infants favoured the talker's eyes over the mouth and showed significant gaze following to the target object. During the subsequent object-naming phase, infants favoured the talker's mouth over the eyes. However, at test, they showed no preference for the named object, nor was this performance modulated by their selective attention pattern during the learning phase. These results suggest that while infants were able to flexibly control their selective attention and focus on the relevant cues at each key-moment during learning, they did not succeed in forming the name-object associations. Potential explanations for these results will be presented and discussed together with on-going follow-up experiments.

**<https://bcccd.slack.com/archives/C02Q2PJ0XCZ>**

**Session 4 [Tuesday, January 11, 20:30 - 22:00 (UTC +0)]**

**Session 5 [Wednesday, January 12, 07:00 - 08:30 (UTC +0)]**

## **A-0154 The Relationship between Critical Brain Dynamics, Autism Symptoms and Language Abilities during Development**

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Electrophysiological dynamics change continuously during early development. Atypical neural development has been related to neurodevelopmental conditions. Here, we study autism, which has been linked to imbalances between the excitatory (E) and inhibitory (I) systems of the brain (Bruining et al., 2020). According to the theory of critical brain dynamics, the implications of an E/I imbalance are that neuronal networks diverge from critical point, which is necessary for optimal information processing in the brain (Linkenkaer-Hansen et al., 2001). Taking language development as a test case, we will investigate how differences in E/I balance and critical brain dynamics relate to language variation and symptom severity in autistic children. To test this, we will here assess resting-state electrophysiological activity (RS-EEG) of 150 autistic children and 180 children without clinical diagnosis between 5-21 years of age from the Healthy Brain Network (Alexander et al., 2017). We will measure critical brain dynamics using long-range temporal correlations (LRTCs) of the EEG in the individual alpha frequency and employ them to determine the E/I balance. Based on previous findings, we expect differential development of LRTCs and E/I balance between autistic and non-autistic children. In addition, we expect a relationship between these neural measures and autism symptoms, measured with the Autism Spectrum Screening Questionnaire (ASSQ), as well as individual language abilities, measured with the Clinical Evaluation of Language Fundamentals (CELF). Such a relationship between neural and cognitive development would suggest that critical brain dynamics are a potential neurobiological mechanism of autism. Results will be presented at the conference.

**<https://bcccd.slack.com/archives/C02PM6VT72R>**

**Session 4 [Tuesday, January 11, 20:30 - 22:00 (UTC +0)]**

**Session 2 [Tuesday, January 11, 07:00 - 08:30 (UTC +0)]**

## **A-0155 Relations between parental input and Theory of Mind understanding in deaf children with cochlear implants in comparison to their peers with typical hearing**

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Previous studies have indicated that parental propensity to talk about mental states may be one of the factors contributing to the child's theory of mind (ToM). ToM development may be delayed in deaf children with cochlear implants (CIs), who are raised by parents communicating only in spoken language – deaf children with CIs may experience limited access to conversations about mental states, which may be one of the factors contributing to the possible delay in their ToM development. However, there are not many studies focusing on parental mental state talk (MST) and ToM in deaf children with CIs. The aim of this study was to investigate ToM and MST in deaf preschoolers with CIs (n = 27) in comparison to their peers with typical hearing (TH) (n = 42). Parents were reading a storybook with their children and their narratives were coded for cognitive, emotional, and perceptual references. Children's ToM was assessed with a parental questionnaire (Theory of Mind Inventory; ToMI-2). Preliminary analyses have indicated different patterns of association between TOMI-2 and MST in studied groups. Specifically, there was a positive significant correlation ( $p < .05$ ) between ToM abilities and parental propensity to use MST even after controlling for children's age, IQ, and parents' verbosity, in children with CIs. These associations did not emerge in children with TH suggesting that parents of deaf children with CIs might promote their children's ToM development during book reading. More data is expected to be collected.

This work was supported by NCN [2017/25/B/HS6/01624]

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**Session 11 [Friday, January 14, 07:00 - 08:30 (UTC +0)]**

**Session 6 [Wednesday, January 12, 13:00 - 14:30 (UTC +0)]**



## **A-0156 Links between social-communicative behaviour and language development in a sample of Hungarian 18-month-olds: what is different in the Covid-19 pandemic?**

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Infants' joint attention (JA) capacities has had an established link to language acquisition. Normally, interactions with caregivers and unfamiliar people, as well as exploration of novel objects and contexts promote practicing JA skills and vocabulary growth. The Covid-19 pandemic resulted in changes of exposure to social interactions and environmental stimuli. We investigated whether JA skills, language development, and their associations differ between the "pre-pandemic group" reared in the normative societal environment (n=51) and the "Covid-19 group" reared for at least 6 months in the time of pandemic (n=57). Firstborn, 18-month-old infants were assessed with the Early Social Communication Scale task measuring JA skills (Mundy et al, 2003) and with the Language Scales of the Bayley-III Scales of Infant and Toddler Development (Bayley, 2005), both administered in the laboratory. In the Covid-19 group as compared to the pre-pandemic group, less initiation of JA was detected through eye-contact (d=0.33) and gaze alternation (d=0.77). No significant differences were found on initiations by pointing, following experimenter's pointing, and on the Bayley-III Language Composite score. Examination of the relations among JA and language variables resulted in the expected significant correlations in the pre-pandemic group, but not in the Covid-19 group. We suppose that the lack of associations could be the result of the pandemic as a moderating factor. While early normative language growth could be maintained by familial interactions, infants' capacity to engage in JA with unfamiliar persons might have been hindered by the reduced diversity of social / environmental stimuli during the pandemic.

<https://bcccd.slack.com/archives/C02PSCXS0P6>

**Session 4 [Tuesday, January 11, 20:30 - 22:00 (UTC +0)]**

**Session 2 [Tuesday, January 11, 07:00 - 08:30 (UTC +0)]**

## **A-0158 Acquisition Order of Spatial Indexicals' Semantic Features**

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Previous studies about children's acquisition of the different semantic features of the spatial indexicals "this" and "that" have not so far yielded a consensus regarding the age of their adult-like understanding. As semantic features, contextuality, distance and speaker relativity were explored. However, the substitution aspect of their meaning, that is, the fact that speakers must use different words to refer to the same thing from different perspectives, has not yet been investigated ("this" from my perspective may be "that" from another's).

The purpose of this ongoing study is to assess the order of acquisition of semantic features of spatial indexicals, including substitution, by children between 3 and 7 years. A within-subject design with two trials for each feature will be presented. At each trial, one or two different animal toys will be presented on a table and the experimenter(s) will ask the child to feed/tickle "this" or "that" one without pointing and with gaze fixated on the participant. Moreover, the toys will be positioned either (1) aligned with the child: having one animal proximal to the child and another distal; or (2) perpendicular to the child with equal distances to the child. By describing possible differences in their understanding, this study will allow to estimate the age range of the respective acquisition of each spatial indexical feature.

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**Session 10 [Thursday, January 13, 20:30 - 22:00 (UTC +0)]**

**Session 8 [Thursday, January 13, 07:00 - 08:30 (UTC +0)]**

## **A-0159 15-month-old infants modulate the weight of spatial serial dependency effects by considering the correctness of previous choices**

Joan Birulés<sup>1\*</sup>, Anna Martínez-Álvarez<sup>2\*</sup>, Ferran Pons<sup>3</sup>, Alexis Pérez-Bellido<sup>3</sup>, Mathilde Fort<sup>1</sup>, Ruth de Diego-Balaguer<sup>3</sup>

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Infants' remarkable learning skills require an optimal allocation of their attentional resources to relevant stimuli. To do so, they must not only orient to salient cues, but also learn to anticipate when and where objects will appear, based on the available cues and previous experience. Studying infants' anticipatory eye movements may unveil some of the mechanisms behind infants' spatio-temporal attentional processes. Prior research has shown that while both 12- and 15-month-olds exhibit spatial anticipatory behaviour based on symbolic cues, only 15-month-olds succeed in using the cues' temporal information (Martinez-Alvarez, Pons & De Diego-Balaguer, 2017). However, it remains unknown if infants' perceptual decisions can also be influenced by expectations built from recent experience (i.e., of previous trials). To investigate this question, we recorded 15-month-olds' eye gaze while performing an anticipatory eye-movement task with two spatio-temporal symbolic cues that predicted the target's position (left/right) and onset time (2/4sec). Our results replicated previous findings by showing that 15-month-olds can use symbolic cues to temporally anticipate a target. Crucially, however, results also revealed that infants' spatial orientation was not explained by symbolic cues but rather by their recent experience. Specifically, we found that infants' attention was spatially biased towards previously attended locations, and that the strength of such bias was gated by the correctness of previous spatial anticipations. Serial dependency effects did not occur in the temporal domain. Our results demonstrate that 15-month-olds can adaptively downplay the weight of prior knowledge in their decisions, an optimal learning strategy already exploited at early ages.

<https://bcccd.slack.com/archives/C02Q2RN0D7B>

**Session 7 [Wednesday, January 12, 20:30 - 22:00 (UTC +0)]**

**Session 8 [Thursday, January 13, 07:00 - 08:30 (UTC +0)]**

## **A-0160 How I wonder what you are: Children's songs as a source of mental state information**

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Storybooks have been proposed as important sources of mental state information, but less is known about the availability of such information in other types of media, such as children's songs, shows, or games. The present study investigated (1) whether children's songs could be potential sources of mental state information and (2) cross-cultural (or cross-linguistic) differences in the availability of such information. We coded for expressions of mental states (i.e., emotion, cognition, desire) and other internal states (i.e., moral evaluation, physiological state, perception, ambiguous internal state) in 255 English songs, likely accessed by children in the United States, and 255 Japanese songs, likely accessed by Japanese children. Majority of the songs in both the English and the Japanese sample contained at least one internal state expression, with songs containing 4 to 5 tokens (i.e., all expressions) and 2 types (i.e., unique expressions) of internal state expressions on average. The English and Japanese songs were overall similar in the absolute number of tokens and types of internal state expressions, except that Japanese songs were richer in ambiguous internal state expressions. When comparing the English and Japanese songs in proportion scores that controlled for the length of songs, there was some evidence that Japanese songs had more types of internal state expressions than English songs. In conclusion, children's songs could be feasible tools for fostering children's understanding of mental states. The role of songs could also differ across cultures, considering the finding that Japanese songs placed greater emphasis on internal states.

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**Session 2 [Tuesday, January 11, 07:00 - 08:30 (UTC +0)]**

**Session 9 [Thursday, January 13, 13:00 - 14:30 (UTC +0)]**

## **A-0162 Changes in the localization of functional activation to repetition sequences in infants across fNIRS studies**

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Infants' ability to perceive repetition-based regularities plays a central role in language acquisition (Marcus et al. 1999) and its neural correlates have been investigated with functional near-infrared spectroscopy (fNIRS; de la Cruz-Pavia & Gervain 2021). However, a systematic comparison across studies of the brain areas involved is missing. In this work, we explored how the pattern of functional activations elicited by different regularities changes across studies and ages.

We examined data from 150 infants (72 M; 91 newborns, 59 six-month-olds), collected in seven fNIRS studies. Stimuli included trisyllabic auditory sequences following a repetition-based regularity (AAB/ABB, e.g. "mubaba"), and random control sequences (ABC, e.g. "mubage"). fNIRS was measured with 24 channels distributed bilaterally to sample the fronto-temporal-parietal regions. After pre-processing and block-averaging, cluster-based permutation tests (1000 iterations; Abboub et al. 2016) were performed to compare changes in oxygenated-hemoglobin concentrations between conditions and identify clusters of spatially-adjacent active channels. Active clusters were then compared across studies.

We found that newborns display a bilateral activations' pattern in the temporo-frontal areas in response to repetition-based sequences, while no significant activation was found for control sequences. By contrast, 6-month-olds activated the temporo-frontal areas bilaterally for the repetition-based and the control sequences. Changes in functional connectivity underlying these patterns are being explored. This finding suggests that the encoding of repetition emerges early and is stable across development, involving bilateral language areas, including the inferior-frontal region, whereas the ability to encode variable syllables as a sequence emerges by 6 months and is supported by similar brain structures.

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**Session 10 [Thursday, January 13, 20:30 - 22:00 (UTC +0)]**

**Session 2 [Tuesday, January 11, 07:00 - 08:30 (UTC +0)]**

**A-0165 The link between number and action in human infants**

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Humans' inborn ability to discriminate, represent, and manipulate numerical quantities' is supported by the parietal cortex, which is also involved in a variety of spatial and motor abilities. While the behavioral links between numerical and spatial information have been extensively studied, little is known about the behavioral connection between number and action. Some studies in adults have shown a series of interference effects when simultaneously processing numerical and action information. We investigated the origins of this link in human infants (7-9 m.o.) using an habituation paradigm. Forty infants were tested in one of two experimental conditions: one group was habituated to congruent number-hand pairings, where the larger the number, the more open the hand-shape associated; the second group was habituated to incongruent number-hand pairings, where the larger the number, the more close the hand-shape associated. In test trials, both groups of infants were presented with one instance of a congruent and one instance of an incongruent pairing (using new combinations of numbers and hand-shapes). We found a significant Habituation conditionxTest trial interaction, as only infants habituated to a congruent number-hand pairing showed a significantly higher looking time to the test trial depicting an incongruent pairing; in contrast, infants habituated to an incongruent pairing did not show any looking time difference between test trials. These findings show that infants spontaneously associate magnitude-related changes across the dimensions of number and action-related information, offering thus support to the existence of an early, preverbal number-action link in the human mind.

<https://bcccd.slack.com/archives/C02PM6UEGER>

**Session 1 [Monday, January 10,20:30 - 22:00 (UTC +0)]**

**Session 8 [Thursday, January 13,07:00 - 08:30 (UTC +0)]**

## **A-0166 Differences in sensitivity and attitude towards dominance between girls and boys**

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By school age, children understand social hierarchies, and can infer power relations from a variety of cues. From early on, they judge dominance based on facial appearance (Terrizzi et al., 2019), which impacts their social attitude and behavior (Charlesworth et al., 2019). Moreover, children tend to view gender as a hierarchical notion. They expect boys to hold higher status and power than girls (Charafeddine et al., 2020; Mandalaywala, et al., 2020). Also, power has more influence on boys' than on girls' social preferences (Charafeddine et al., 2021; Mandalaywala, et al., 2021). Here we investigated children's dominance evaluations of faces, as a function of participant gender and target gender.

In each trial, 4-to-6-year-old children saw same-gender pairs of faces. One face was high on dominance, and one was low on dominance, based on adult evaluations. First, children had to say which individual looked stronger, and which one looked less strong. Second, they had to indicate which individual they preferred to play with. Preliminary results (N = 44 out of 100; MAge = 5.5 years, 20 girls) revealed that boys' dominance judgements were more consistent than those of girls, whose evaluations were at chance ( $p = .02$ ; MBoys = 70%; MGirls = 56%). Second, boys showed a significant preference for the dominant individual (MDominant = 66%), while girls preferred the submissive character (MDominant = 28%). Our findings suggest that girls are not sensitive to dominance cues from faces, and that children prefer to associate with those conforming with their gender role.

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**Session 10 [Thursday, January 13, 20:30 - 22:00 (UTC +0)]**

**Session 8 [Thursday, January 13, 07:00 - 08:30 (UTC +0)]**

## **A-0167 The different role of the puzzle-box scheme presentation for overimitation effect in 8-9-year-olds**

Tatyana Kotova, Irina Mikhailova

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The overimitation effect is a tendency of humans to copy both causally relevant and irrelevant demonstrated actions to retrieve a reward from a puzzle-box. It is still unclear which factors of demonstration modify this effect, along with the question of ages this effect applies to. Moreover, some aspects of demonstration (e.g., eye contact) have different impact on overimitation effect at different ages. Previously we have found that preschoolers, 7-year-olds and 8-year-olds when presented immediately after demonstration of actions with the puzzle-box, its scheme, which does not include parts for irrelevant actions performing, did not repeat irrelevant actions, i.e., did not over-imitate. However, only part of 8-year-olds chose not to imitate irrelevant actions when they were presented with the scheme including all the parts. Since the outward reactions of these participants to the presentation of the scheme were different from those who then committed imitation (they repeatedly shifted their eyes from the scheme to the puzzle-box and back, as if to compare them), we assumed that their attitude toward the scheme was different. To test this hypothesis, we demonstrated three irrelevant actions and one relevant action with puzzle-box and showed the scheme with all the parts to 57 8-9-year-olds. Next, we divide them into groups: Group1-made less than two comparisons between the puzzle-box and the scheme; Group2-made two or more comparisons. We found that participants in Group1 imitated significantly more irrelevant actions than in Group2( $p=0,02$ ). The possibility of using the same communicative cue in different roles in social learning will be discussed.

<https://bcccd.slack.com/archives/C02PSF165RA>

**Session 2 [Tuesday, January 11, 07:00 - 08:30 (UTC +0)]**

**Session 3 [Tuesday, January 11, 13:00 - 14:30 (UTC +0)]**



## **A-0168 Training of naming object features and learning new categories in 6-8 year old children**

Zherdeva Maria, Kotov Alexey, Bachurina Valentina, Monina Maria

Higher School of Economics, Moscow, Russia

Nameability of object features is among the factors that facilitate learning new categories. We adapted the task used by Zettersten & Lupyan (2018) for children (N=49) and found that this nameability effect could not be found in children younger than 8-year-olds. In the following experiment, we added training in naming object features before the learning task to test whether children trained in naming features to retain information in working memory would use this strategy in learning. Children aged 6-7 years (N=39) participated in the study. In the group with verbalization training, the children first performed a visual working memory task. They were shown an image with sectors of different color, and then the image was replaced with another image in which one of the sectors changed its color. Children had to verbally describe all of the colors. The second group of children performed the same task silently. After training, children performed a learning task in which we measured learning success and visual fixations on a relevant feature. After learning, children answered questions about the category rule. The results showed that verbalization training did not lead to more successful learning. However, children in the condition with verbalization training were better at formulating the rule they found and rated the task as easier. This finding suggests that while verbalization training might not improve children's learning abilities directly, it improves their meta-cognitive appraisal of their own learning process. Funding: The reported study was funded by RFBR, project number 20-013-00698

**<https://bcccd.slack.com/archives/C02PM6STF0V>**

**Session 8 [Thursday, January 13, 07:00 - 08:30 (UTC +0)]**

**Session 6 [Wednesday, January 12, 13:00 - 14:30 (UTC +0)]**

## **A-0169 Category learning strategy and attention optimization in adults and children**

Bachurina Valentina, Zherdeva Maria, Kotov Alexey

HSE University, Moscow, Russia

Studies show that adults and children use different strategies when learning new categories depending on category structure. Deng & Sloutsky (2016) found that adults employ rule-based verbal strategy when categories have deterministic features (i.e. 100% probability of belonging to a certain category) and prototypical non-verbal strategy when all features are probabilistic. However, young children prefer non-verbal strategy in both cases. Presumably, rule-based strategy is associated with selective attention, while non-verbal strategy is associated with diffused attention, yet most studies of attention in category learning rely on behavioral effects to infer attentional distribution, despite the availability of eye-tracking technology. In this study, we combined the use of category training and transfer paradigms (see Miles & Minda, 2009 and Deng & Sloutsky, 2016) and eye-tracking methods to investigate attentional patterns of children and adults during category learning. A group of participants (N = 53, 30 adults, 23 children, aged 6-11) performed a category learning task, during which their eye-movements were recorded and dwell time on each object feature was calculated. Results of mixed ANOVA with within factor (interest area of a feature, IA) and between factors (age group and strategy) showed a significant main effect of interest area, as well as interaction effects for IA and age, IA and strategy. Post-hoc t-tests revealed that participants of all ages fixate more on the deterministic feature when rule-based strategy is chosen, albeit this effect is stronger in adults. Funding: The reported study was funded by RFBR, project number 19-313-51010

<https://bcccd.slack.com/archives/C02PHDZ8KHU>

**Session 2 [Tuesday, January 11, 07:00 - 08:30 (UTC +0)]**

**Session 9 [Thursday, January 13, 13:00 - 14:30 (UTC +0)]**

**A-0171 Object Labeling Effects on Memory in 6-8 year old children**

Koroleva Svetlana, Kotov Alexey, Kotova Tanya

HSE University, Mocsow, Russia

In a study we replicated the verbal overshadowing effect of category names in children, using a task with remembering images after classification or preference (Lupyan, 2008). Children between the ages of 6-8 participated in the study. Forty pictures of chairs and lamps were used for the material. The task was modified for the children: the children gave answers on a touch screen by touching the images of the answer categories and there was no time limit on the answer. During the image memorization session, children in the classification group chose an object category (by touching the conditional image of a lamp or a chair), and children in the preference group chose the option to like the image or not (images of smiley faces). During the test session, children were shown the same images with the same number of new images of lamps and chairs. In this series, they gave answers as to whether they had seen the image before or not. As a result, we found that children had fewer correct detections in the classification condition than in the judgment condition, but the number of false alarms did not differ. We also found differences in criterion: children were more cautious in making a decision in the classification condition than in the judgment condition. These results were in complete correspondence with those of Lupyan (2008) on adults, except that children's average memorization success was lower. Funding: The reported study was funded by RFBR, project number 20-013-00698

<https://bcccd.slack.com/archives/C02PQ5XE77V>**Session 5 [Wednesday, January 12, 07:00 - 08:30 (UTC +0)]****Session 12 [Friday, January 14, 13:00 - 14:30 (UTC +0)]**

## **A-0172 The effect of moral information on in-group favouritism in pre-schoolers and first graders**

Katalin Egyed, Gerda Szalai

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Much evidence shows that children favour their in-group and disfavour unfair behaviour. Nevertheless, we have mixed results regarding evaluation when in-group preference and moral sentiments conflict. We investigated this conflict in pre-schoolers and first-graders by targeting the participants' gender as group membership and demonstrating an unfair in-group and a fair out-group sharing action during Manipulation. In-group bias was tested in forced choice tasks that were different in nature. To check the effect of morality, our design was to test in-group bias before and after the moral information of Manipulation. After Manipulation children participated in two conditions: they evaluated the Same puppets they knew from Manipulation (SamePC) and a new in-group and out-group one too (NewPC). As we expected, in-group bias manifested before Manipulation in each test and in both age groups, and a more complex pattern of moral effect occurred after Manipulation, depending on the condition, the nature of the utilized forced choice task, and the participants' age. After Manipulation in SamePC in-group preference decreased in each age group, which suggests moral effect. In line with the predicted developmental difference, this effect was stronger in older children. Furthermore, in NewPC both age groups showed strong in-group preference, that is, moral effect was not generalized to unfamiliar group members. In sum, the detailed result pattern confirms that monitoring in-group bias in the context of gender as real group membership and a conflict between of ingroup favouritism and moral behaviour can contribute to better understanding in-group bias in children.

<https://bcccd.slack.com/archives/C02PQ62CU7M>

**Session 7 [Wednesday, January 12,20:30 - 22:00 (UTC +0)]**

**Session 11 [Friday, January 14,07:00 - 08:30 (UTC +0)]**

## **A-0173 Empathic Concern, Respiratory Sinus Arrhythmia, and Physiological Synchrony in 9-months-old Infant-Mother Dyads**

Markus R. Tünte, Celine Dorczok, Stefanie Höhl

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Already in the first two years of life infants respond to another person's pain with empathic concern. In the present study, we replicated an empathic concern paradigm in which mothers displayed simulations of distress by pretending to hurt either knee or finger while interacting with their child. Infant's reaction was video coded for self-distress, concerned affect, prosocial-, and inquiry behavior. We extended video coding of the distress simulation by rating length and intensity of the mother's behavior, and the extent to which the infant had witnessed the event. Electrocardiogram was recorded from mother and infants during distress-episodes and neutral play-phase to compute respiratory sinus arrhythmia (RSA) and physiological synchrony, using a sliding window method. Regarding behavioral data, our preregistered analysis of the whole sample (N = 90) indicated that infants displayed stronger behaviors on all four scales during the distress-episodes, compared to a neutral play-phase (all  $p < .001$ ). Further, a longer and more intense maternal distress simulation was related to increased empathic concern ( $p < .001$ ) and inquiry behavior ( $p = .02$ ). However, whether the infant witnessed the event did not impact behavior. Regarding RSA, our preliminary analysis (N = 12) indicates no increased RSA and RSA-synchrony for distress-episodes, compared to neutral-episodes. However, analysis of the whole dataset is needed to confirm these preliminary results. In summary, our results replicate previous findings, showing that empathic concern can be measured in 9-month-old infants by video coding reactions to maternal distress simulations and highlight the importance of incorporating the mothers' reaction.

<https://bcccd.slack.com/archives/C02P9FRC0JK>

**Session 10 [Thursday, January 13, 20:30 - 22:00 (UTC +0)]**

**Session 2 [Tuesday, January 11, 07:00 - 08:30 (UTC +0)]**

## **A-0174 Category learning in children is associated with mental attentional capacity, but not with verbal fluency**

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Learning new categories occurs through a strategy of remembering surface similarity of objects, or through learning verbal rules. It has been shown that children are more likely to focus on surface similarity (Miles, Minda, 2009), and that the transition in the strategies used occurs at age 6-8. According to the COVIS model (Ashby, Valentin, 2017), cognitive control and working memory play an important role in learning verbal rules. Working memory is related to a characteristic such as mental attention capacity (Powell, Arsalidou, Vogan & Taylor, 2014), and verbal flexibility is related to cognitive control (Snyder, Munakataa, 2010). In the present study, we tested hypotheses about the relationship of category learning performance to two indices: mental attention capacity and cognitive control. We were interested in two age groups: 6-8 years old (age of transition between strategies) and 9-11 years old. We used a task to measure the performance of learning the new categories (Deng, Sloutsky, 2016): children were taught to distinguish fictional creatures and then determine category membership by switching defining and probabilistic features. We also used tasks to measure mental attention capacity (Powell et al., 2014) and verbal flexibility (Snyder, Munakataa, 2010). Correlation analysis found a positive correlation between the mental attention capacity and category learning success in each age group. However, no relationship between categorical learning performance and verbal flexibility was found in any of the age groups. These results will be interpreted with the COVIS model. Funding: The reported study was funded by RFBR, project number 19-313-51010

**<https://bcccd.slack.com/archives/C02PQ82MWTV>**

**Session 5 [Wednesday, January 12, 07:00 - 08:30 (UTC +0)]**

**Session 3 [Tuesday, January 11, 13:00 - 14:30 (UTC +0)]**

## **A-0175 Linking Children's Empathy to their Politeness Lies - An Intervention Study**

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Empathy is a causal driver of prosocial behavior. We here ask whether it also fosters prosocial lie-telling in politeness contexts (henceforth: polite lie-telling). Polite lies are an adaptive strategy for navigating complex social environments as they help uphold social relationships and maintain social norms. The current study investigates whether empathy drives polite lie-telling among 96 German children aged 5.0-8.5 years. Half of the children participate in a picture-story-based intervention in which we aim to foster children's empathy by modeling empathy with the respective story character. The other half partakes in a closely matched control condition lacking empathic content. Children's empathy is assessed with a novel empathy measure before and after the experimental manipulation. Finally, we observe children's behavior in a politeness situation in which they are asked to rate an artist's drawing of bad quality. Data collection is currently ongoing but will be completed in 2021. Preliminary results based on a third of the final sample suggest that participating in the empathy condition promotes children's empathy as indicated by the pre-post-intervention assessment. However, the promotive effect of the intervention on children's empathy does not foster lie-telling. If this finding prevails further data collection, our study will raise doubt on causal claims regarding the link between empathy and prosocial lie-telling. This research is a first step towards investigating empathy's causal impact on children's polite lie-telling. Lastly, the novel empathy measure and intervention may be applied in future research to study causal effects of children's empathy on their (pro)social behaviors more generally.

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**Session 4 [Tuesday, January 11, 20:30 - 22:00 (UTC +0)]**

**Session 11 [Friday, January 14, 07:00 - 08:30 (UTC +0)]**

## **A-0177 Fun isn't easy: Children optimize for difficulty when "playing for fun" vs. "playing to win" in a game design task**

Mariel K. Goddu<sup>1</sup>, Joshua S. Rule<sup>2</sup>, Elizabeth Bonawitz<sup>1</sup>, Alison Gopnik<sup>2</sup>, Tomer Ullman<sup>1</sup>

<sup>1</sup>Harvard University, <sup>2</sup>University of California, Berkeley

The well-known "explore-exploit" dilemma trades off behavior with two distinct functions. \*Exploring\* optimizes for gaining information, and \*exploiting\* optimizes for gaining a reward. But, what are children optimizing for when they \*play\*? One idea is that play supports "COMPETENCE-BASED CURIOSITY." If playing optimizes for gaining information about one's own abilities, children should choose to make a game harder when "playing for fun" vs. "playing to win." We introduced n=37 participants aged 4-10 (M = 7.5 years, SD = 2.1) to a novel bowling game. We asked children forced-choice questions about how to structure the activity when playing for fun versus when playing to meet a win-criterion. Questions concerned either "goal-relevant" factors that affect the likelihood of winning stickers (which should differ between play-mode vs. win-mode), or "goal-irrelevant" factors (which should not). We calculated a weighted average for play and exploit responses, and a difference score between these averages. Scores for goal-relevant variables (M = 0.33, SD = 0.39) differed significantly from goal-irrelevant variables (M = 0.03, SD = 0.26);  $t(36) = -3.87$ ,  $p < .001$ , and indicated a PREFERENCE FOR DIFFICULTY IN PLAY,  $t(36) = 5.15$ ,  $p < .001$ . For goal-irrelevant variables, there was no difference between play-mode and exploit-mode,  $t(36) = 0.62$ ,  $p = .54$ . Age predicted neither goal-relevant variable scores ( $r = 0.21$ ,  $p = 0.20$ ) nor goal-irrelevant ( $r = -0.02$ ,  $p = 0.91$ ). These results suggest that CHILDREN CHALLENGE THEMSELVES MORE WHEN PLAYING than when they are exploiting. Ongoing investigations probe this tendency in naturalistic behavior.

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**Session 4 [Tuesday, January 11, 20:30 - 22:00 (UTC +0)]**

**Session 12 [Friday, January 14, 13:00 - 14:30 (UTC +0)]**



## A-0178 Using engagement to predict word learning by toddlers in an online task

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Young children engage with screens multiple times a day, so it is important to study the factors impacting children's learning. Engagement is considered a necessary condition for learning (Aguiar & McWilliam, 2013), yet it has typically been reported only as a secondary result in studies assessing word learning in digital contexts (see Myers et al. 2017; Roseberry et al. 2014; Strouse et al., 2018; Troseth et al., 2006) although we know that social contingency and co-viewing moderate learning outcomes in children, particularly in digital environments (Myers, et al., 2017; Roseberry et al., 2014; Strouse et al., 2018). We ask whether children's level of engagement moderates learning in online contexts, predicting learning outcomes.

We conducted a word learning study remotely with children at home and collected data via webcam. Twenty-one children (24- to 48-months,  $M = 38$ ) saw four novel objects, two of which were labeled, via prerecorded video or live video-chat. In test, children heard the novel labels and were asked to select the novel object from a set of three. We measured child engagement through (a) observational coding from webcam videos (b) parent ratings and (c) experimenter ratings. Engagement measures moderated referent selection outcomes, yet no single measure reliably moderated outcomes, instead, there were significant interactions between age, observation, and rating measures ( $\beta = 2.82$ ) and between observation and rating measures ( $\beta = -1.14$ ). Our findings suggest that depending on age, different engagement measures may better capture learning outcomes.

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**Session 10 [Thursday, January 13, 20:30 - 22:00 (UTC +0)]**

**Session 6 [Wednesday, January 12, 13:00 - 14:30 (UTC +0)]**

## **A-0179 Do violations of expectation about action efficiency influence infants' social learning?**

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Most of what infants learn they learn from others. However, not all individuals provide information that is functionally and culturally relevant. Here, we aim at studying how the presentation of events that violate infants' core knowledge about agency influences selective learning. Previous studies have found that violations of core knowledge enhance learning about objects. However, in social learning, violations of expectations about agency may signal who is not a reliable source of information, rather than an opportunity for learning. To address this hypothesis, we presented 17- and 19-month-olds infants with agents who reached for and grasped a novel object either efficiently (expected action) or inefficiently (unexpected action), and then labeled the object with a novel word. At test, infants saw the target object paired with a new object side by side, and they heard a label that was either consistent or inconsistent with the target's label. In addition, the agent was paired with a new agent side by side as they explained a story, while only the voice of one of them was played. We measured infants' visual preferences to explore (1) how they learned about information provided by the agent (label-object association) and (2) how they learned about properties of the agent (agent-voice association). A pilot study suggested that the efficiency of others' actions may influence infants' subsequent learning from agents and about agents. Data collection for the main study is ongoing (current N = 85; expected N = 100), and the analysis and main hypothesis were pre-registered (<https://osf.io/b3j2m>).

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**Session 10 [Thursday, January 13, 20:30 - 22:00 (UTC +0)]**

**Session 12 [Friday, January 14, 13:00 - 14:30 (UTC +0)]**

**A-0180 Children's fairness concerns in distribution dilemmas**

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Recent studies have shown that between ages 3-8, children's fairness concerns become more complex. Young children are first concerned with distributing resources equally to all actors. Older children then consider situational factors like the actors' merit or need and distribute resources more equitable. However, little is known about the relative contribution of the factors merit and need to children's allocation decisions. In our study, we asked 5- to 8-year-olds (N=110) to distribute resources between two monsters in a distribution dilemma: One monster was poor, but lazy; the other was hard-working, but rich. Additionally, children distributed resources in two baseline trials where we only varied one respective factor between the monsters: neediness (rich vs. poor; baseline1) and merit (hard-working vs. lazy; baseline2). We compared children's distribution in the dilemma to the baselines to investigate the relative contribution of merit and need. Preliminary analyses indicate that the older children are, the fewer resources they allocate to the lazy-poor monster in the dilemma compared to the poor monster in the baseline1. Rather, their allocation becomes more similar to that of a lazy (but not poor) monster in the baseline2. This supports previous work showing that with age, children allocate resources more equitably, considering contextual factors. However, our study additionally shows that the factor merit gains relative weight when merit and neediness are pitted against each other in an allocation dilemma. Further analysis investigating factors explaining individual differences in the tendency to prefer meritorious allocations are currently ongoing.

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**Session 11 [Friday, January 14, 07:00 - 08:30 (UTC +0)]**

**Session 12 [Friday, January 14, 13:00 - 14:30 (UTC +0)]**

## **A-0181 Where is the treasure? Investigating information-search competence in 2.5- to 3-year-olds**

Nora Swaboda<sup>1</sup>, Azzurra Ruggeri<sup>1,2,3</sup>

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<sup>3</sup>Central European University

Previous research suggests that children's information search remains largely inefficient until age four. Here, we investigate the early emergence of children's information-search competence using a simplified version of Lindow's (2021) "Finding Presents Game". Participants (30- to 48-months olds) have to find a treasure hidden in one of three closed boxes. The boxes all have particular shapes, colours and images on their top. They are identical but for one feature (e.g., all boxes are red hexagons, but one has an apple, one a duck and one a star on them). To identify the target box, children receive three cards revealing either the target's colour, shape or image, and all available variants of each feature on their backside (e.g., the shape card shows three hexagons, the colour card shows three red blobs, the icon card shows an apple, a duck and a star). The cards are placed frontside down in front of the children, who are allowed to flip one card before deciding which box to open. Crucially, as the boxes differ on only one feature (e.g., the image), only one card contains information relevant for the decision and should be revealed. Preliminary data suggest that 77% of children (N = 22) flip the relevant card suggesting that, at least in a highly simplified paradigm as ours, children as young as 2.5 years can efficiently search for information to guide their decision. Our findings highlight the importance of using age-appropriate paradigms to gain a more fine-grained picture of children's emerging information-search abilities.

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**Session 4 [Tuesday, January 11, 20:30 - 22:00 (UTC +0)]**

**Session 5 [Wednesday, January 12, 07:00 - 08:30 (UTC +0)]**

**A-0182 Children's developing intuitions of the controllability of beliefs**

Joshua Confer, Hanna Schleichauf, Jan Engelmann

University of California, Berkeley

Beliefs play a critical role in our lives and in society. Currently, beliefs about the danger of a virus lead to life-changing consequences and spark hostile conflicts in public discourse. We often get angry and blame others when they do not possess the beliefs we think they should hold. But how truly responsible are we for our beliefs? Can people freely decide to choose one belief over another? In philosophy, whether beliefs are voluntary is controversial (James, 1937; Ganapini, 2020). Yet recent psychological work indicates that adults endorse the ability to control one's mental states, especially beliefs (Cusimano & Goodwin, 2019). However, much is still unknown about how we perceive the controllability of beliefs, particularly in young children. While research has investigated children's judgments of the controllability of actions (Kushnir et al., 2015), very little is understood about their judgments of the controllability of beliefs. In two pre-registered studies, we tested how 5-6- and 7-8-year-old children and adults judge the controllability of others' beliefs. Specifically, how perceptions of control may depend on the available evidence for a belief (Study 1) and the morality of a belief (Study 2). In Study 1 (N = 120), children and adults judged that people have full control over a belief that's not supported by evidence or that's contradicted by evidence. However, children and adults judged that people have much less control over a belief that's supported by strong evidence. We aim to finish data collection for Study 2 by the end of September 2021.

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**Session 1 [Monday, January 10, 20:30 - 22:00 (UTC +0)]**

**Session 8 [Thursday, January 13, 07:00 - 08:30 (UTC +0)]**

## **A-0183 Children's Repair of Communication Breakdowns: The Role of Maternal Feedback Strategies**

Ezgi Yıldız<sup>1</sup>, Berna A. Uzundağ<sup>2</sup>

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The ability to describe entities according to the addressee's needs continues to develop in preschool ages. In experimental settings, young children are able to improve their descriptions after receiving feedback from the listener. However, the types of caregiver feedback that lead children to repair their descriptions during caregiver-child interaction remain unknown. In this first study examining this question, 54 children ( $M(SD)=56.6(6.9)$  months) and their mothers played a communicative game where in each of twelve trials children described a target picture among two similar and one dissimilar distractors for their mothers. Mothers' feedback following their children's inadequate descriptions was coded as (1) specific request (e.g. is the hat blue?), (2) wh-question (e.g. which color?), or (3) recast (e.g., repetition). We also coded whether mothers requested information about all the missing attributes of the target picture. Children's descriptions in each attempt were coded for their adequacy and the number of pictures the descriptions corresponds to (i.e. message ambiguity). Mothers' information requests for all the missing attributes of the picture led children to produce more accurate descriptions in their second (Estimate=7.75, SE=1.02,  $p<.001$ ) and third attempts (Estimate=5.08, SE=1.19,  $p<.001$ ) and reduced the ambiguity of their second (Estimate=-.80, SE=.06,  $p<.001$ ) and third (Estimate=-.48, SE=.04,  $p<.001$ ) descriptions. Furthermore, the ambiguity of children's second descriptions decreased after receiving wh-questions (Estimate=-.14, SE=.07,  $p=.03$ ). Overall, our findings suggest that wh-questions and maternal feedback prompting children to mention the distinguishing attributes of the entities to be described lead children to repair their descriptions.

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**Session 5 [Wednesday, January 12,07:00 - 08:30 (UTC +0)]**

**Session 9 [Thursday, January 13,13:00 - 14:30 (UTC +0)]**

## **A-0187 Developmental Trajectories of Neural Tracking in Developmental Dyslexia**

Marina Berg<sup>1</sup>, Lars Meyer<sup>1,2</sup>, Hannah Plueckebaum<sup>1</sup>, Katharina H. Menn<sup>1,3,4</sup>

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Reading and writing skills form the basis for academic success and social relationships. 4-9 % of children show clinical reading deficits, diagnosed as developmental dyslexia. The causes of dyslexia might relate to impairments in acoustic-phonological speech processing. Behavioral studies found that children with dyslexia show difficulties in perception of amplitude rise times at syllabic and phonemic scale, which are important for discriminating sounds (Goswami et al., 2010). Sensitivity to syllable onset rise times can predict phonological awareness skills, which are crucial for reading acquisition (Goswami et al., 2002). These behavioral differences may be explained by differences in neural processing of speech. Specifically, it has been suggested that children and adults with dyslexia show impaired neural tracking of speech acoustics (Molinaro et al., 2016). It remains unclear, however, how these impairments develop across childhood with respect to phonological and reading abilities. In our planned study, we will compare tracking in 150 dyslexic children from the Healthy Brain Network (Alexander et al., 2017) aged 6-17 years, to age- and non-verbal IQ matched typically developing children. Tracking will be measured using speech-brain coherence, which quantifies the synchronization between speech and electrophysiological activity. In addition, we will investigate the relationship between tracking and phonological processing more directly, by analyzing the correlation of speech-brain coherence with phonological awareness and reading abilities. We hypothesize that tracking at the phonemic frequency is related to phonological awareness. Further, we will explore how this correlation develops with increasing reading abilities. Results will be presented at the conference.

<https://bcccd.slack.com/archives/C02PSF32204>

**Session 1 [Monday, January 10, 20:30 - 22:00 (UTC +0)]**

**Session 3 [Tuesday, January 11, 13:00 - 14:30 (UTC +0)]**

## **A-0188 Chimpanzees' responses to emotional expressions and its relation to behavioural markers of empathy: A behavioural and thermal investigation**

Diane A. Austry, Jake S. Brooker, Zanna Clay

Durham University, Durham, UK

Recent behavioural studies have demonstrated that our great ape cousins, the chimpanzees and bonobos, show similar consolatory responses to those of young children when witnessing the distress of others, which are considered to be markers of empathy. However, understanding the underlying mechanisms driving this empathic-like behaviour remain little understood. In order to address this, we combined behavioural experiments using the non-invasive technique of infrared thermography with observations of the consolatory responses of the same subjects towards their peers during naturalistic observations. To do so, we examined the facial temperature variation of N = 25 sanctuary-living chimpanzees housed in Chimfunshi Wildlife Orphanage, Zambia in response to video clips depicting both familiar and unfamiliar conspecifics as well as humans showing negative, positive, and neutral emotional states. We also examined the subjects' spontaneous consolatory responses in response to conspecific victims in distress during post-conflict contexts. Results showed that the facial temperature change in the periorbital region upon observing a peer in distress predicted a subject's consolation rate in naturalistic settings. Within the experiment, we also found that thermal variation in the nose tip region was predicted by stimulus familiarity for positive emotion expressions as well as subject age. Overall, this project highlights the relationship between internal arousal and external empathic responding in chimpanzees, as well as effects of familiarity and age. It also highlights the complexity of studying the mechanisms supporting empathy while providing new insights into the use of infra-red thermal imaging as a method for studying emotional responding.

**<https://bcccd.slack.com/archives/C02QDS3SMQ8>**

**Session 4 [Tuesday, January 11, 20:30 - 22:00 (UTC +0)]**

**Session 9 [Thursday, January 13, 13:00 - 14:30 (UTC +0)]**



## **A-0189 Do preschoolers interpret behaviors that reduce another agent's action costs as helping?**

Laura Schlingloff<sup>1</sup>, Barbara Pomiechowska<sup>1</sup>, Denis Tatone<sup>1</sup>, Gergely Csibra<sup>1,2</sup>

<sup>1</sup>Central European University, Austria/Hungary; <sup>2</sup>Birkbeck, University of London, UK

A large body of literature suggests that from a young age, children have a sophisticated concept of helping, which they use to reason about others' social interactions and to evaluate prospective partners. What does this concept consist of and which diagnostic features allow children to identify instances of helping? Adults have been shown to interpret an action as helping when the helper's behavior reduced the action costs of another goal-directed agent, even if no concurrent cues of social interaction were present (Ullman et al., 2009; He et al., 2020). Here we test whether 3-year-olds apply similar reasoning to interpret actions that affect others' utility.

In an experiment conducted online, we show children videos of animated characters in which an agent (Protagonist) approaches a goal object by detouring around obstacles. In some events, a second agent (Helper) moves the obstacles aside to allow the Protagonist to take a shorter path to the object. In others, a third agent (Non-Helper) performs a superficially similar action towards an obstacle that is not actually blocking the Protagonist's path. We test whether children can selectively interpret the obstacle-pushing behavior as helping when it leads to a reduction of the Protagonist's action costs and whether they expect the Helper to pursue this goal in a novel context. Results will be presented at the conference.

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**Session 4 [Tuesday, January 11, 20:30 - 22:00 (UTC +0)]**

**Session 6 [Wednesday, January 12, 13:00 - 14:30 (UTC +0)]**

## **A-0192 Sources of Inefficiency in Preschoolers' Information Search**

Kai-Xuan Chai<sup>1</sup>, Nora Swaboda<sup>1</sup>, Fei Xu<sup>3</sup>, Azzurra Ruggeri<sup>1,2</sup>

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Although children's sensitivity to others' informativeness emerges already early in life, their active information search becomes robustly effective only around age 10. In this paper, we investigate the emergence of children's active learning efficiency by eliminating a potential confound present in previous research: children's verbal abilities. In particular, the current study employed an object-selection, non-verbal version of the 20-question game to explore the age-related change of 4- to 7-year-olds information search efficiency. Our results showed that, even in this version, preschoolers performed worse even than simulated random agents. However, crucially, preschoolers performed better than the simulated random agents when excluding unnecessary queries associated with zero information gain (IG), that is, queries made after only one hypothesis was left. When additionally excluding all redundant queries children made, their performance looked on par with that from the simulated optimal agents. Our study replicated and supplemented previous research, revealing a purer developmental improvement of information search efficiency during preschool age. We also confirmed the hypothesis that unnecessary queries are a crucial source of inefficiency in children's information search.

<https://bcccd.slack.com/archives/C02P9HWL4LX>

**Session 4 [Tuesday, January 11, 20:30 - 22:00 (UTC +0)]**

**Session 6 [Wednesday, January 12, 13:00 - 14:30 (UTC +0)]**

## **A-0193 Understanding of differences in verbal and figurative representations by children 4-6 years old**

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In our study we examined the ability to distinguish between verbal and visual representation in pre-school children. The main difficulty in studying this cognitive function is that for preschool children the survey-like techniques that are used for adults (e.g., Blajenkova, Kozhevnikov, & Motes, 2006) are not appropriate. We decided to develop a new task in which children first had to learn new signs denoting different types of representation. In the picture story task, children had to learn how to use the new symbols to compare different formats of imagination (in the form of inner speech and visual images) in story characters, and then apply these symbols to describe their own representation in solving different tasks. The report will present the results of a pilot test of the method, which involved a group of preschoolers between the ages of 5 and 7 and school children between the ages of 7 and 10. Preliminary results show that the majority of preschool and school-age children successfully learn the symbols and use them to distinguish verbal representation from visual representation in characters (more than 80% of preschool children and school-age children). At the same time, only 67% of preschoolers and 100% of schoolchildren can apply these symbols to describe their own representation. In this report we will discuss the further development and application of this technique to the study of preschool children's meta-cognitive abilities. Funding: The reported study was funded by RFBR, project number 20-013-00698

**<https://bcccd.slack.com/archives/C02PHE0R81L>**

**Session 11 [Friday, January 14, 07:00 - 08:30 (UTC +0)]**

**Session 3 [Tuesday, January 11, 13:00 - 14:30 (UTC +0)]**

## **A-0195 The developmental trajectory of subjective probabilistic uncertainty and information search strategies in Entropy Mastermind**

Lara Bertram<sup>1,2</sup>, Jonathan D. Nelson<sup>1,2</sup>, Azzurra Ruggeri<sup>2,3,4</sup>

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Humans are surprisingly good at solving extremely complex problems, navigating pseudo-infinite hypotheses spaces with only limited computational resources. In this project, we investigate the developmental trajectory of this sophisticated competence. In particular, we focus on 8- to 12-year-old children's (planned  $n = 150$ ) understanding of probabilistic uncertainty and its relationship with their information search strategies, using the code-breaking game Entropy Mastermind (EM). EM is an app-based single-player game based on the classic Mastermind game, in which players have to guess a secret code (i.e., which sequence of fruits has been randomly sampled from a jar) by making sequential queries and interpreting the feedback received. To increase the complexity of the game across levels, we manipulate the entropy in the game environment, that is, the predictability of the fruit code, by varying the initial distribution over the pool of fruits, and the length of the code to be guessed. Preliminary results ( $n = 9$ ,  $Mage = 9.9$ ) suggest that age predicts entropy intuitions and selection of first guesses in EM: Younger children evaluate entropy by counting the number of different kinds of items, whereas older children shift their focus towards relative proportions of kinds of items in the distribution. This is behaviorally reflected by an increased adaptivity to the probability distribution in the jar, i.e., a higher joint probability of items in first guesses, in older children. Entropy literacy, i.e., understanding of the axioms of entropy, is more pronounced in older children and predicts behavioral adaptivity to probabilistic uncertainty.

<https://bcccd.slack.com/archives/C02P9FTDQ6B>

**Session 5 [Wednesday, January 12, 07:00 - 08:30 (UTC +0)]**

**Session 3 [Tuesday, January 11, 13:00 - 14:30 (UTC +0)]**

**A-0200 Rhythm & language abilities in typically developing infants**Sofia Russo<sup>1</sup>, Giulia Calignano<sup>1</sup>, Carnovalini Filippo<sup>2</sup>, Barbara Arfé<sup>1</sup>, Antonio Rodà<sup>2</sup>, Eloisa Valenza<sup>1</sup><sup>1</sup>Dipartimento di Psicologia dello Sviluppo e della Socializzazione, Università degli Studi di Padova.,Via Venezia 8 – 35131, Padova, Italy; <sup>2</sup>Dipartimento di Ingegneria Informatica, Università degli Studi di Padova, Via Gradenigo 6/b – 35131, Padova, Italy

The ability to process rhythm is a powerful and widespread tool for the temporal encoding of sequential stimuli (Patel, 2006). During the first steps of language acquisition, infants benefit from rhythmic cues in starting to organize linguistic stimuli (Nazzi et al., 1998). Moreover, recent findings indicate atypical rhythm processing as a potential underlying impairment among different speech/language disorders (Ladányi et al., 2020). However, nowadays models of cognitive development do not yet include rhythmic tasks in early screening programs, as further knowledge is needed on individual differences and developmental trajectories. Therefore, the present study investigates the link between rhythm sensitivity and early language abilities across infancy (10 to 30 months). In a first experiment, rhythm discrimination skills are tested through a familiarization-test paradigm. Rhythms are presented in the touch modality, through a custom-made, vibrotactile device for music perception. In a second experiment, infants are tested in a verbal-learning task. Pupillometry and looking times toward contingent visual stimuli are collected with the eye-tracker and taken as an index of attentional engagement in the two tasks. Preliminary results (20 subjects) indicate i) infants being able to discriminate between different rhythms in the touch modality, and ii) individual performances in the verbal-learning task to be related with early rhythmic skills. These results point toward a potential role of rhythmic tasks in contributing to the assessment of infants' cognitive development, especially in the case of language acquisition, with positive impacts on early screening and training programs involving musical rhythm and multisensorial modalities.

**<https://bcccd.slack.com/archives/C02PQ60Q6UT>****Session 1 [Monday, January 10, 20:30 - 22:00 (UTC +0)]****Session 12 [Friday, January 14, 13:00 - 14:30 (UTC +0)]**

## **A-0201 Playing hide and seek: what environmental cues drive young children's memory-guided attention?**

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Memory-guided attention refers to the influence of previous experiences in guiding attention when similar situations are encountered and even in new environments. A large body of literature has explored this phenomenon in adults, showing that repeated exposure to the same visual context leads to faster attentional deployment and target detection (Chun, 2000). However, this effect is less robust in children, and, to the best of our knowledge, it has never been explored in toddlers (Jiang et al., 2019). The present study investigates the development of memory-guided attention between 3 and 5 years of age. Eighty-three children were presented with three fixed spatial configurations of bushes and were asked to guess the location of a hiding monkey. Each configuration showed three green bushes and one pink bush, behind which the target was hiding. After this learning phase, participants completed a preferential-choice task. In the control trials, they were asked to decide whether the monkey was more likely to be in a spatial configuration previously observed or in a new configuration in which green bushes were displayed randomly. In the spatial trials, random and fixed configurations either contained pink and green bushes or green-bushes-only, forcing participants to use the spatial context to find the target. Results show a ceiling performance in the control trials compared to the spatial trials, suggesting that participants learned the association colourful bush-target. Furthermore, children's performance significantly improves with age in the spatial trials, underling the emergence of a sensitivity towards the spatial context during development.

**<https://bcccd.slack.com/archives/C02P9FT3CBZ>**

**Session 4 [Tuesday, January 11, 20:30 - 22:00 (UTC +0)]**

**Session 3 [Tuesday, January 11, 13:00 - 14:30 (UTC +0)]**

## **A-0202 Development and function of explicit and diffuse iconic gestures in narratives of preschool children**

Anne Németh<sup>1</sup>, Friederike Kern<sup>1</sup>, Sofia Koutalidis<sup>1</sup>, Ulrich Mertens<sup>2</sup>, Katharina Rohlfing<sup>2</sup>, Stefan Kopp<sup>1</sup>, Olga Abramov<sup>1</sup>

<sup>1</sup>Universität Bielefeld, Germany; <sup>2</sup>Universität Paderborn, Germany

Research suggests that children and adults' speech-gesture production correlates with communicative genres, cognitive developmental stages and individual differences (Alamillo, Colletta & Guidetti, 2013; Capirci et al., 2007; Sekine et al., 2015). While studies with adults propose that iconic gestures may be evolving in an ongoing interaction, with the co-participant co-constructing their meaning (Goodwin, 2003; Streeck, 2009), little is known about how children make use of gestural reference and how iconic gestures correlate with the interactive processes in activities like storytelling.

In the EcoGest project, we video-recorded 46 preschool children aged four years whilst producing different communicative genres with an interlocutor (e.g. explanation, narrative, illustration). The results showed evidence for several important relations – e.g. communicative genre and iconic gestures (Rohlfing et al.), gesture viewpoint and spatial competence (Mertens et al., 2019), cognitive abilities and semantic features (Abramov et al., 2021), the influence of input modality on narrative elaboration (Carshaw et al., 2020).

The current study's aim was an in-depth analysis of the global semantic structure of the children's oral narration and their connection with the use and (pragmatic) function of iconic gestures. This study compares explicit iconic gestures in contrast to less elaborate/diffuse constructed ones, and how this correlates with discourse competence and possible developmental changes (Mertens & Rohlfing, 2021). First results are presented and will be discussed.

<https://bcccd.slack.com/archives/C02PQ532KDG>

**Session 4 [Tuesday, January 11, 20:30 - 22:00 (UTC +0)]**

**Session 11 [Friday, January 14, 07:00 - 08:30 (UTC +0)]**

## **A-0205 Altercentric interference vs. bias in 7.5 month-old infants: a pupillometry study**

Velisar Manea, Dimitrios Askitis, Emanuela Yeung, Victoria Southgate  
University of Copenhagen

While adults experience altercentric interference, their own perspective still dominates. We build on our previous work on testing the altercentrism hypothesis - according to which, for infants, the others' perspective dominates (Southgate, 2020) - with a pupillometry study (7.5 month-olds) conceptually based on Kovacs et al. (2010). Infants see an agent watching a ball stopping behind an occluder; then the agent is hidden by curtains, and the ball rolls outside: the agent last saw the ball inside, the participant last saw the ball outside (P-A+). In the baseline manipulation (P-A-) both the participant and the agent see the ball going out. At the end of trials, the occluder is lowered, revealing empty space. As in the box outcome condition, the agent never comes back, as we want to see if babies learn only the co-witnessed information. They do ( $BF = 6$ ), but on its own, this is only evidence that the agent's perspective interferes with what infants encode.

In the reverse condition (done by November), which Kovacs ran only with adults, the agent is hidden after seeing the ball exiting, then the ball comes back and stops behind the occluder (P+A-). Here, adults' representation of the ball's presence was not influenced by the agent's attending to it going out. We hypothesized that if infants have an altercentric bias, they would be less surprised by the object's absence when the agent attended to it exiting (P+A-) than when both saw the ball in, stopping behind the occluder (P+A+).

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**Session 1 [Monday, January 10, 20:30 - 22:00 (UTC +0)]**

**Session 11 [Friday, January 14, 07:00 - 08:30 (UTC +0)]**



## **A-0207 The variation in the set of the ostensive cues in adult communication according to the age of a child**

Liliia Terekhina<sup>1</sup>, Tatyana Kotova<sup>2</sup>, Alexey Kotov<sup>1</sup>

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The natural pedagogy approach (Gergely,Csibra,2005) explains the social learning mechanism through the characteristics of human communication, a set of ostensive cues. However, in the further development of the child, the role of ostensive communication is expected to be played by other signals, not always in accordance with the order of communicative development (Kotova,2016). We study which communicative signals are used sustainably by adults when interacting with young and preschool children, and whether this set is fixed in the course of development or not. Fourteen children in the 2-7 age range and their caregivers participated. Each adult should show his/her child how to use an object, then given him to repeat it on their own. The chosen object (e.g., a pipette with water) should be unknown to the child previously. Videos are annotated, the following annotation contains speech, gaze direction and manipulations. The results show that the older the children, the more available the complex verbal forms of communication become. At the same time, the principle of cues is maintained and consists in drawing the attention of the child to important details. When older children(4-7y.o.) did something wrong, adults reported the mistake with words and were less likely to correct it with their own hands, but for young children(2-3y.o.) adults do corrective manipulations. Thus, speech in communication with older children assumes the functions of those ostensive signals used in interaction with an infant (eye contact) or a young child (corrective action).

**<https://bcccd.slack.com/archives/C02PSCYR62Y>**

**Session 2 [Tuesday, January 11,07:00 - 08:30 (UTC +0)]**

**Session 12 [Friday, January 14,13:00 - 14:30 (UTC +0)]**

## **A-0208 Development of a touchscreen based language measure for French toddlers**

Cecile Crimon<sup>1</sup>, Sho Tsuji<sup>2</sup>, Alejandrina Cristia<sup>1</sup>, Anne-Caroline Fiévet<sup>1</sup>, Anne Christophe<sup>1</sup>

<sup>1</sup>École Normale Supérieure de Paris; <sup>2</sup>International Research Center for Neurointelligence, The University of Tokyo

The aim of this study is to develop a direct, quick, and reliable measure of language development in young children. Basing ourselves on previous efforts to develop a touchscreen based language test (Friend & Keplinger, 2008, Lo et al. 2021), that allow to directly measure word comprehension and speed of processing, we here add several novelties : our test is not only composed of a 2-alternative-forced-choice word comprehension task, but also of a novel word learning and phonological neighbour distinction task; it is aimed at French children from a wide age-range (20-32 mo) and meant to be easily administered in non-lab settings. In a pilot lab experiment, we tested 22 French children, aged 19-23 months, from a high-SES. Parents completed the French MBCDI. Our preliminary results show that children find the test engaging, with children completing on average 77% of the test (SD = 26), and actively answering for 70% of those trials (SD = 0.18). Regarding children's scores, they show an average percentage for correct answers above chance (M = 0.68, SD = 0.17), and this score was significantly predicted by their score at the MBCDI. In the coming months, we will administer our test on a larger sample of children (around 80 children), coming from a diverse social and linguistic background, by going to our partner daycares in the Paris region, France. This will allow us to check the feasibility of such measure for wider scale research and test the adaptedness of this test to older children.

**<https://bcccd.slack.com/archives/C02QDS6NVC0>**

**Session 11 [Friday, January 14, 07:00 - 08:30 (UTC +0)]**

**Session 6 [Wednesday, January 12, 13:00 - 14:30 (UTC +0)]**

## **A-0209 Two routes to relational inferences: interaction schemas and utility calculus**

Denis Tatone

Department of Cognitive Science, Central European University, Vienna, Austria

The gamut of social interactions can be organized along an interdependence continuum, from by-product mutualism (surface coordination directed at individual goals) to full-fledged altruism (prosocial acts directed at increasing the utility of social partners). These interactions are defined by specific payoff structures, with mutualism yielding local utility-positive outcomes (the rewards that each participant reaps outweigh the participation costs), and altruism yielding local utility-negative ones. I shall argue that young children use differences in payoff structure to infer the existence of stable social relationships from the observation of episodic interactions. Specifically, I hypothesize that children should be more likely to interpret interactions yielding utility-negative outcomes as indicative of associations in which individual participation costs are directly or indirectly recouped over time. I suggest two routes through which these relational inferences may be carried out: via interaction schemas or online (social) utility calculus. In the former, relational inferences are automatically supplied through the activation of schemas prepared to identify relationship-relevant encounters. In the latter, they are worked out by analyzing the payoff distribution of an observed interaction. While the first route allows young learners to infer relationships without requiring genuine utility computations, its scope is limited to the number and kinds of schemas that children possess. Conversely, while the second route provides an open-ended analysis of social interactions, it presupposes the ability to produce nested utility functions. I shall discuss the early understanding of “giving” and “helping” interactions to critically illustrate these two mechanisms and draw predictions about their developmental timelines.

<https://bcccd.slack.com/archives/C02PHE12J22>

**Session 8 [Thursday, January 13, 07:00 - 08:30 (UTC +0)]**

**Session 6 [Wednesday, January 12, 13:00 - 14:30 (UTC +0)]**

## **A-0210 Developing a modified False Belief Task to study Theory of Mind development in sighted children of parents with visual impairment.**

Joanna Wysocka<sup>1</sup>, Karolina Golec<sup>1</sup>, Agnieszka Pluta<sup>1,2</sup>, Maciej Haman<sup>1</sup>

<sup>1</sup>University of Warsaw, Faculty of Psychology, Warsaw, Poland; <sup>2</sup>World Hearing Center, Institute of Physiology and Pathology of Hearing, Warsaw, Poland

From birth, sighted children of blind parents (SCBP) are immersed in a specific environment of selectively reduced eye contact. To date, the impact of this early communicative experience on social and cognitive outcomes in this group has rarely been examined. Given the vital role of joint attention (a shared focus of two individuals on the object) for developing the Theory of Mind (ToM), one might expect that constrained face-to-face communication with a parent could have a detrimental effect on SCBPs' mentalizing abilities. However, the results of limited studies with the participation of SCBP show that already in their first year of life, they are likely to switch between different channels of social communication, depending on who they interact with (e.g. Senju et al., 2013). This early-emerging flexibility may facilitate other aspects of SCBPs' development, including executive functions (EF), as observed in bilingual children (Kovács, 2009). Moreover, taking into account their unique experience, SCBP might be earlier to realize that not only visual but also e.g. auditory access can serve as a source of knowledge and use it effectively in the social context. To test this hypothesis, a modified version of a classic change-of-location False Belief Task has been designed by adding a False Belief condition, in which the agent cannot see, but can hear the object's transfer. The results of the pilot study aimed at task validation, conducted in the control group of typically developing preschoolers raised by sighted parents, will be presented.

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**<https://bcccd.slack.com/archives/C02PHE21C7Q>**

**Session 8 [Thursday, January 13, 07:00 - 08:30 (UTC +0)]**

**Session 3 [Tuesday, January 11, 13:00 - 14:30 (UTC +0)]**

**A-0211 The Sandbox Task – Measuring implicit and explicit Theory of Mind**

Marie Luise Speiger<sup>1</sup>, Katrin Rothmaler<sup>1</sup>, Feride Nur Haskaraca Kizilay<sup>2</sup>, Ulf Liszkowski<sup>3</sup>, Hannes Rakoczy<sup>2</sup>, Charlotte Grosse Wiesmann<sup>1</sup>

<sup>1</sup>Max Planck Institute for Human Cognitive and Brain Sciences, Leipzig; <sup>2</sup>Georg-August-University, Göttingen; <sup>3</sup>University of Hamburg

Until recently, Theory of Mind (ToM) – the ability to ascribe mental states to others – was assumed to develop around the age of 4 years. In the past, this capacity was tested using verbal false belief (FB) tasks. The last 1.5 decades provided data suggesting ToM abilities already before 2 years of age using non-verbal FB tasks. Recent data indicates that verbal and non-verbal ToM abilities may rely on different processing systems, often referred to as implicit and explicit ToM. The system underlying implicit ToM, however, requires further investigation and a direct comparison to explicit ToM is missing. We adapted an existing FB task – the Sandbox task (Bernstein, 2011) – which yields a continuous measure for explicit ToM by measuring an egocentric bias in one’s judgement of another person’s false belief about an object location. In addition, we developed an implicit version of this task, which measures an altercentric bias in one’s own judgement of an object’s location. To establish the task, we tested it in an online study with 96 adults, using Bayesian sequential hypothesis testing we found evidence for an altercentric bias that depended on the order in which the tasks were conducted. The altercentric bias was only present when participants conducted the explicit task first (BF = 7.33), indicating that the bias may depend on highlighting the agent’s perspective. Currently, we are testing the task tablet-based with children aged 3 to 6 years, data collection is ongoing, we anticipate to present the results of 60 children.

**<https://bcccd.slack.com/archives/C02P9FSCT2B>**

**Session 1 [Monday, January 10, 20:30 - 22:00 (UTC +0)]**

**Session 9 [Thursday, January 13, 13:00 - 14:30 (UTC +0)]**

## **A-0212 The role of grammar and descriptions in referent identification**

Gabor Brody, Roman Feiman

Department of Cognitive, Linguistic, and Psychological Sciences, Brown University, USA

How do children connect expressions (e.g. “that red apple”) to the physical objects they refer to (that red apple)? According to descriptivist views, dominant in developmental psychology, they rely primarily on the content encoded in words/concepts (red, apple). In contrast, theories within natural language semantics posit that the grammar first establishes whether the referent is already part of the discourse: a introduces new objects; that points to entities that are already made salient. Descriptive information guides identification only after the grammar.

In a pair of studies, we compared these views by testing 50 adults and 30 children (ages 3-5yo). In our novel “referent-transformation task”, participants saw multiple objects belonging to two categories (e.g. hammers and rockets). Then one of the objects “magically” transformed (e.g. a hammer turned into a rocket). We asked participants to “give” one of the objects, and tested which requests participants would understand as referring to this transformed object. We asked participants to click on “<a/another/that> <hammer/rocket>”, manipulating the noun to correspond to either the initial (e.g. hammer) or the final (e.g. rocket) object. We found that, consistent with “grammar-first” accounts, adults relied on the determiner to establish the referent, even when the noun did not describe the object anymore (choosing the hammer-turned-into-a-rocket when asked for “that hammer”). In contrast, children based their responses solely on the noun. We will discuss the possibility that children start out with a description-first approach before attaining an adult-like grammar-first state.

**<https://bcccd.slack.com/archives/C02QDUB4Y9E>**

**Session 4 [Tuesday, January 11, 20:30 - 22:00 (UTC +0)]**

**Session 3 [Tuesday, January 11, 13:00 - 14:30 (UTC +0)]**

## **A-0213 Differential effects of expectancy violation and visual salience on infants' and toddlers' associative learning**

Yu Jin Rah, Sang Ah Lee

Department of Brain and Cognitive Sciences, Seoul National University, Korea

Past research has shown that violation of expectancy, for instance in intuitive physics, enhances infants' learning. However, little is known about whether this effect of expectancy violation is just due to an increase in attention or due to a change in learning. In the present study, we tested this idea by comparing the effects of expectancy violation to that of visual salience on remembering a sound associated with the target object. 17 children (age: 4 to 36 months old) participated in an online study of item-sound associative learning with the two experimental conditions above. First, children saw a demonstration of the target object displaying salient visual effects (e.g., heart/bubble animated effects) or a violation of intuitive physics (e.g., ramp-shelf solidity violation). To induce associative learning, children were then shown the object paired with a sound. Afterwards, they were presented with the target and novel object together with the sound. Their gaze patterns were recorded through webcams. Both salient visual effects and expectancy violation caught children's interest, increasing their attention and looking time, compared to the control condition. Interestingly, how long children looked at the expectancy-violated event (i.e., how surprised they were) was significantly correlated with children's associative learning scores (i.e., their preferred looking to the target at the presentation of the paired sound), but this was not the case in the visual salience condition. These results suggest that violation of expectation does more than simply draw children's attention to the stimuli and induces a change in the learning process itself.

<https://bcccd.slack.com/archives/C02PHDWJ0TG>

**Session 5 [Wednesday, January 12, 07:00 - 08:30 (UTC +0)]**

**Session 6 [Wednesday, January 12, 13:00 - 14:30 (UTC +0)]**

## **A-0214 The power of promises on delay of gratification**

Bahar Koymen, Rebecca Koomen, Leonor Goncalves, Owen Waddington, Keith Jensen  
Manchester, UK

Children find it very difficult to inhibit eating a treat that is in front of them even though this means not getting a second treat later (Mischel, 1974). In a social version of the Marshmallow Test, when the outcome of being able to delay gratification were interdependent – based on the choices of both participants – children were better able to wait for a second reward (Koomen et al., 2020). Promises may play a role in being able to delay gratification. Promises are important for cooperation by establishing trust (e.g., Kanngiesser, Koymen & Tomasello, 2017). The current study explores the role of commitments in the form of promises using a Marshmallow Test.

In this study, children from 5 to 6 years are presented with a treat; whether they get a second one depends not only on their ability to inhibit eating it but also on the actions of a partner. Due to restrictions on face-to-face testing, the study is being conducted online (Zoom). Children are tested at home with the assistance of their parents/caregivers. Participants are introduced to either a partner (recording of a confederate) who promises that he will not eat his treat (Promises condition), or a partner (same confederate) who says he thinks he will eat it (Social Risk condition). If either the participant or the confederate eats their treat, neither gets a second one. Data collection is ongoing; the latest results will be presented.

**<https://bcccd.slack.com/archives/C02PQ5XSTQT>**

**Session 1 [Monday, January 10, 20:30 - 22:00 (UTC +0)]**

**Session 9 [Thursday, January 13, 13:00 - 14:30 (UTC +0)]**



**A-0220 Beat and sequence representation in newborn infants**Gábor P. Háden<sup>1</sup>, Fleur Bouwer<sup>2</sup>, Henkjan Honing<sup>3</sup>, István Winkler<sup>1</sup>

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Newborn infants have been shown to extract temporal regularities from sound sequences, both in the form of learning ordered sequences of sounds, and in the form of extracting periodicity in the input, commonly referred to as a beat. However, these two types of regularities are often indistinguishable in isochronous sequences, as both statistical learning and beat perception can be elicited by the regular alternation of accented and unaccented sounds. Here, we manipulated the isochrony of sound sequences in order to disentangle statistical learning from beat perception in sleeping newborn infants in an EEG experiment, as previously done in adults and macaque monkeys. We used a binary accented sequence that induces a beat when presented with isochronous timing, but not when presented with randomly jittered timing. We compared mismatch responses to infrequent deviants falling on either accented or unaccented (i.e. odd and even) positions. For the isochronous sequences, a difference between these positions would suggest the presence of both beat perception and statistical learning, but for the jittered sequences only the presence of statistical learning. Results show a clear difference between positions in the isochronous condition, but no difference in the jittered condition. This suggests that beat processing is present in newborns. However, the current paradigm did not show statistical learning despite clear previous evidence for this ability in newborns. The results will be discussed considering the statistical learning literature and results from the same paradigm in adults and monkeys.

<https://bcccd.slack.com/archives/C02PQ60V8TD>

**Session 10 [Thursday, January 13, 20:30 - 22:00 (UTC +0)]**

**Session 11 [Friday, January 14, 07:00 - 08:30 (UTC +0)]**

## **A-0221 Rhythm and language in infants: A motor perspective**

Sinead Rochan Adam Attaheri, Áine Ní Choisdealbha, Perrine Brusini, Sheila Flanagan, Natasha Mead, Panagiotis Boutris, Samuel Gibbon, Helen Olawole-Scott, Christina Grey, Isabel Williams, Henna Ahmed, Emma Macrae, Usha Goswami

Centre for Neuroscience in Education, University of Cambridge

The BabyRhythm project is a longitudinal study of 122 infants from two to 30 months of age, investigating neural entrainment and sensorimotor synchronisation (SMS) to acoustic rhythm, in relation to typical language development. Here we present motion capture data recorded from infant drumming measured at five timepoints from five - 11 months of age. Longitudinal mixed effects models showed that whilst infants cannot yet reliably synchronise their movement to auditory rhythms, their ability to match the tempo they are hearing improves with age. This improvement is also expressed as an increased ability to decelerate from their spontaneous motor tempo, to better accord with the incoming tempo. We further found that infants become more regular drummers with age, with marked decreases in the variability of their spontaneous motor tempo and decreased drumming variability in response to drumbeats. This latter effect is subdued in response to more complex linguistic stimuli. From 12 months of age, infants took part in a large battery of language tasks, assessing vocabulary, gesture, phonology, grammar and speech timing. Here we present an overview of our linguistic measures and their relation to SMS. We consider how our motion capture SMS measures can be used to identify behavioural markers of high and low language ability.

**<https://bcccd.slack.com/archives/C02PHG2UN78>**

**Session 7 [Wednesday, January 12, 20:30 - 22:00 (UTC +0)]**

**Session 3 [Tuesday, January 11, 13:00 - 14:30 (UTC +0)]**

## **A-0222 Chicken and egg? Unravelling the links between over-imitation and social affiliation**

Bahar Tunçgenç<sup>1</sup>, Lauren Marsh<sup>2</sup>, Trinh Nguyen<sup>3</sup>, Stefanie Hoehl<sup>3</sup>

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Children readily copy other people's actions, including actions that are apparently unnecessary for the end-goal. A decade of research shows that this phenomenon called over-imitation facilitates children's learning of the social-contextual cues and that over-imitation is accentuated in social contexts. Yet, it is unclear whether this is because children over-imitate more the people they already like or because children feel stronger affiliation after over-imitating someone. To unravel the directionality of these links, in this pre-registered study, we conducted causal modelling in a pre-post design. Forty 5-8 year-old children watched an actor perform unnecessary actions (e.g., stroking the box) while opening five simple, transparent boxes. Before and after this box-opening task, children indicated on an ordinal scale how close or distant they preferred to be to the actor in hypothetical scenarios (e.g., at the cinema). Finally, children made a "thank you" card for the actor, where they could share some of the five stickers they got for participation in the study. A structural equation model showed that children's prior affiliation to the actor did not influence over-imitation, whereas amount of over-imitation increased affiliation. Moreover, children who over-imitated spent significantly more time preparing a "thank you" card but were not more likely to share stickers. These findings are in line with the dual-process model of over-imitation (Schleihauf & Hoehl, 2020). Findings will be discussed in relation to the broader developmental frameworks, outlining the critical role of carer-infant movement alignment for infants' social-cognitive development.

<https://bcccd.slack.com/archives/C02P9FRDM0F>

**Session 7 [Wednesday, January 12, 20:30 - 22:00 (UTC +0)]**

**Session 3 [Tuesday, January 11, 13:00 - 14:30 (UTC +0)]**

## **A-0223 Children's referential iconic gestures in narratives predict better-structured stories at later ages**

Ingrid Vilà-Giménez<sup>1,2</sup>, Ö. Ece Demir-Lira<sup>3,4,5</sup>, Pilar Prieto<sup>2,6</sup>

<sup>1</sup>Universitat de Girona, Catalonia; <sup>2</sup>Universitat Pompeu Fabra, Catalonia; <sup>3</sup>University of Iowa, USA;

<sup>4</sup>DeLTA Center; <sup>5</sup>Iowa Neuroscience Institute; <sup>6</sup>Institució Catalana de Recerca i Estudis Avançats

Gesturing is a powerful tool across language learning. Importantly, evidence has demonstrated that complex gestures performed in children's more elaborated discourses (i.e., narratives) still act as harbingers of next linguistic steps. For instance, using iconic character-viewpoint gestures when performing narratives can predict later better-structured, complete goal-based stories. However, there are no previous studies that have assessed and compared the predictive effects of other gesture types (i.e., referential iconic gestures and non-referential beat gestures) performed in narrative corpora in children's later narrative productions. To address this question, the present study follows a longitudinal approach with an audiovisual corpus of natural narrative productions ( $n = 332$ ) at two time points in development (Time 1, at 5-6; and Time 2, two years later) from 83 children, who were administered a narrative retelling task with the same two wordless cartoons at each time point. Narratives collected at Time 1 were coded for gesture type and at Time 2 were analyzed and scored for narrative structure. A stepwise regression analysis examined the predictive value of gesture production (iconics vs. beats) at 5-6 years in later narrative performance. Results found that iconic gestures (as opposed to beats) performed in children's narratives were significant predictors of better-structured narratives two years later. Findings are interpreted within a theoretical framework that supports the beneficial role of embodied narrative retellings using body movements in narrative abilities. All in all, this study suggests that gesture types performed while retelling stories can contribute differently when predicting oncoming changes in narrative production.

<https://bcccd.slack.com/archives/C02Q2PLLFCH>

**Session 3 [Tuesday, January 11, 13:00 - 14:30 (UTC +0)]**

**Session 7 [Wednesday, January 12, 20:30 - 22:00 (UTC +0)]**

## **A-0224 Associations between naturally occurring variation in caregiver touch & infant oxytocin and social orienting**

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Research suggests that caregiver touch might affect infant learning. This could happen through touch signalling to the infant that they should orient to the caregiver and learn from them; in this respect, touch could act much like infant directed speech or eye gaze. Oxytocin, a hormone associated with social orienting, and sensitive to tactile interactions, could be involved in this mechanism. In our study, we investigated the association between naturally occurring variation in caregiver touch (long-term and short-term) and oxytocin levels in 6- to 13-month-old infants (n = 71). Caregiver touch was assessed long-term, with a self-report measure and short-term, during an interaction observed in the lab. Moreover, we measured infant social orienting in an eye tracking task in which infants saw one face amongst an array of non-social objects; compared to previous studies presenting only faces and failing to observe increased attention with social touch (e.g. Della Longa et al, 2017), we reasoned that an array would rule out ceiling effects on attention. However, we did not find evidence that caregiver touch, long-term or short-term, associates with infant social attention or salivary oxytocin levels. However, we found that salivary oxytocin predicted infant attention to faces relative to non-social objects; this finding corroborates the involvement of oxytocin in social attentional processes in infancy. To conclude, overt attention to social stimuli does not seem to be modulated by touch, though touch might affect the way social stimuli are processed (e.g. by adding an affective-motivational value, or influencing the depth of processing).

**<https://bcccd.slack.com/archives/C02PQ5USV8B>**

**Session 7 [Wednesday, January 12, 20:30 - 22:00 (UTC +0)]**

**Session 9 [Thursday, January 13, 13:00 - 14:30 (UTC +0)]**

