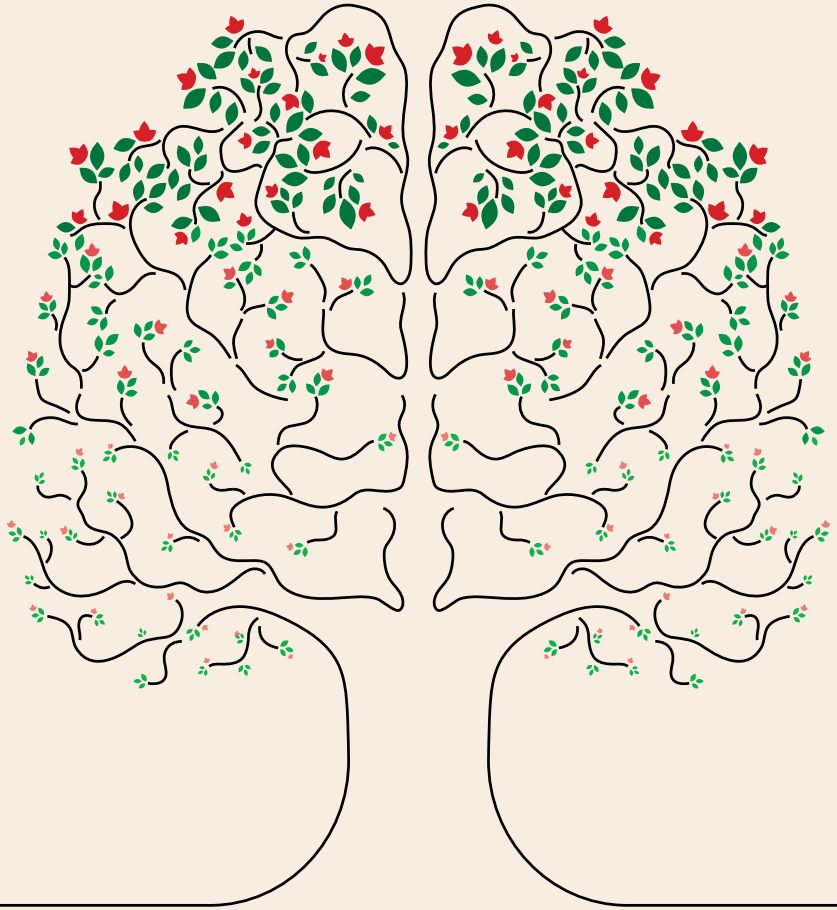
BC3D

BUDAPEST
CEU CONFERENCE
ON COGNITIVE
DEVELOPMENT

2024



CEU CENTRAL EUROPEAN UNIVERSITY

	Thursday, January 4	Friday, January 5	Saturday, January 6
08:30	**Pre-conference events** The ManyBabies Project ... (Workshop) *Auditorium A* Advances in infant neuroscience ... (Workshop) *Auditorium B* Bayesian models of science learning in Python (Tutorial) *Room 103* Python fundamentals for eye-tracking research (Tutorial) *Room 202*		
09:30		Invited Lecture 2 **Victoria Southgate** ***Uniquely infant social intelligencen*** *Auditorium*	Invited Lecture 3 **Martin Giurfa** ***Exploring dimensions of cognition in miniature brains: from concepts, numbers and awareness in honey bees*** *Auditorium*
10:15	Coffee Break *Lobby*		
10:45	**Pre-conference events** The ManyBabies Project ... (Workshop) *Auditorium A* Advances in infant neuroscience ... (Workshop) *Auditorium B* Bayesian models of science learning in Python (Tutorial) *Room 103* Python fundamentals for eye-tracking research (Tutorial) *Room 202*	Coffee Break + Group Photo *Lobby*	Coffee Break *Lobby*
11:15		Paper session 2: **Numerical cognition** *Auditorium*	Paper session 5: **Language and symbolic representation** *Auditorium*
12:15		Lunch Break	Lunch Break
13:00	BCCCD24 Welcome		
13:15	Symposium 1 ***Influences of Agency Attributions and Related Factors on Moral Concern About Nature Across Development*** *Auditorium*	Symposium 2 ***How Cognition Develops In Social Contexts*** *Auditorium*	Symposium 3 ***The ontogeny of social influences on memory and communication in infants and young children*** *Auditorium*
14:30	**Poster Session A** with coffee & snacks *1st floor*	**Poster Session B** with coffee & snacks *1st floor*	**Poster Session C** with coffee & snacks *1st floor*
16:30	Paper session 1: **Knowledge** *Auditorium*	Paper session 3: **Cross-cultural research** *Auditorium*	Paper session 6: **Exploration and curiosity** *Auditorium*
17:30	Short Break	Short Break	Short Break
17:45	Invited Lecture 1 **Sandra Waxman** ***Becoming human: How (and how early) do infants link language and cognition*** *Auditorium*	Paper Session 4: **Comparative cognition (4 talks)** *Auditorium*	Paper session 7: **Perception (4 talks)** *Auditorium*
18:25			
19:00	**Welcome Reception** 19:00-21:00 *Lobby*	**Mulled Wine Reception** 19:15-21:00 *Rooftop Terrace*	**Gala Dinner & Closing Party** 20:00-03:00 *Radisson*

BCCCD 2024

Budapest CEU Conference
on Cognitive Development

Program and Abstracts

ORGANIZED BY

Cognitive Development Center
Central European University

January 4-6, 2024
Budapest, Hungary
https://bcccd.org/

CONFERENCE ORGANIZATION

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

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CONTENTS

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SCHEDULE

THURSDAY, 4 JANUARY

08:30-12:30 PRE-CONFERENCE EVENTS

13:00-13:15 BCCCD24 WELCOME

13:15-14:30 SYMPOSIUM 1

14:30-16:30 POSTER SESSION A

(with coffee & snacks)

THURSDAY, 4 JANUARY

16:30-17:30 PAPER SESSION 1

17:30-17:45 SHORT BREAK

17:45-19:00 INVITED LECTURE 1

19:00-21:00 WELCOME RECEPTION

FRIDAY, 5 JANUARY

09:30-10:45 INVITED LECTURE 2

Uniquely infant social intelligence 25
Victoria Southgate

10:45-11:15 COFFEE BREAK + GROUP PHOTO

11:15-12:15 PAPER SESSION 2

NUMERICAL COGNITION 38

Does language shape children's understanding of numerical concepts? 38
Akshita Srinivasan, Simge Topaloglu, Kexin Que, Çiğdem İleri, Aylin Küntay, Stella Christie, Jesse Snedeker, Elizabeth Spelke

Geometric content of visual forms representations in children and adults 39
Léa Lefer, Penelope Maran, Judith Vergne, Lucie Martin, Ana Duron, Théo Morfoisse, Viviane Huet, Maxine Dos Santos, Véronique Izard

From symbols to concepts: Learning numerals changes numerical thinking 40
Jenna Croteau, Joonkoo Park

12:15-13:15 LUNCH BREAK

13:15-14:30 SYMPOSIUM 2

How cognition develops in social contexts 41

Group membership biases how children evaluate evidence 42
Joshua Confer, Hanna Schleihauf, Dorsa Amir

Social Metacognition – Effects of a social test context on young children's metacognitive insight 43
Marlene Meyer, Marina Proft, Lydia Paulin Schidelko, Hannes Rakoczy, Jan Engelmann

Preschoolers' Emerging Cognitive Capacity to Understand and Shape Their Own and Others' Reputations 44
Trisha Katz, Michael Tomasello

14:30-16:30 POSTER SESSION B 106
(with coffee & snacks)

FRIDAY, 5 JANUARY

16:30-17:30 PAPER SESSION 3

17:30-17:45 SHORT BREAK

17:45-19:05 PAPER SESSION 4

19:15-21:00 MULLED WINE RECEPTION

(Rooftop terrace)

SATURDAY, 6 JANUARY

09:30-10:45 INVITED LECTURE 3

Exploring dimensions of cognition in miniature brains: from concepts, numbers and awareness in honey bees 26
Martin Giurfa

10:45-11:15 COFFEE BREAK

11:15-12:15 PAPER SESSION 5

LANGUAGE AND SYMBOLIC REPRESENTATION 52

Not a pipe: 15-month-olds accept arbitrary objects as symbols for familiar kind tokens 52
Barbu Revencu, Barbara Pomiechowska, Gabor Brody, Gergely Csibra

Can someone really fall in despair?: Facilitating children's processing of metaphors through Theory of Mind training 53
Fatma Nur Öztürk, Duygu Özge

Really, he dased the cat to the boy? Two-year-olds exploit grammatical and thematic content to learn novel verb meanings 54
Giulio Massari, Vincenzo Moscati, Anne-Caroline Fiévet, Alex de Carvalho

12:15-13:15 LUNCH BREAK

13:15-14:30 SYMPOSIUM 3

The ontogeny of social influences on memory and communication in infants and young children 55

14-month-olds' semantic processing is modulated by the perspective of others 56
Dora Kampis, Victoria Southgate

Communication vs. visually induced belief attribution in infancy: others' beliefs influence 18-month-olds' pointing behavior 57
Bartuğ Çelik & Ágnes Melinda Kovács

Altercentric biases in the Sandbox task depend on the development of explicit belief reasoning 58
Marie Luise Speiger, Katrin Rothmaler, Hannes Rakoczy, Ulf Liszkowski, Charlotte Grosse Wiesmann

14:30-16:30 POSTER SESSION C 146
(with coffee & snacks)

SATURDAY, 6 JANUARY

16:30-17:30 PAPER SESSION 6

17:30-17:45 SHORT BREAK

17:45-19:05 PAPER SESSION 7

20:00-03:00 GALA DINNER & CLOSING PARTY

(Radisson Blu Béke Hotel)

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PRE-CONFERENCE EVENTS

PRE-CONFERENCE EVENT 1

The ManyBabies Project: How it works, what it contributes to developmental cognitive science, and how to get involved

Thursday, 4 January, 8:30-12:30

Organizer:

Tobias Schuwerk, Ludwig-Maximilians-Universität München

Workshop

Overview and motivation:

The ManyBabies Project is a collaborative research initiative that studies core theoretical and methodological questions in developmental cognitive science. By conducting large-scale, multi-lab replications of fundamental findings in infant cognition, the project addresses issues of replicability and generalizability in developmental cognitive science, while quantitatively exploring factors that contribute to cross-lab variation. These efforts generate large, diverse datasets that can be used to investigate novel questions via spin-off projects. Researchers at all career stages from around the world work together developing novel methodological approaches, harmonizing research practices and promoting transparent research practices.

We start this workshop with an introduction to the ManyBabies framework, explaining its main goals, workflows, and measures taken in an effort to create and facilitate an open, positive, and inclusive research environment. Subsequently, we provide updates from the ManyBabies subprojects. In part three, we synthesize developments from each project to shed light on emerging project-overarching theoretical and methodological advances. We will discuss not only what we have learned so far about the specific phenomenon under study, but also across different phenomena, for example about the strength of different paradigms. Further, we will discuss pros and cons of doing science as a big team effort. Philosopher Suilin Lavelle will enrich this part as a discussant with an interdisciplinary perspective on the current state of developmental cognitive science. Finally, we present ways of getting involved with the ManyBabies framework, especially as early career researchers. We will explain how researchers with different backgrounds, expertises and resources can join the project.Speakers will include: Judit Gervain (University of Padua, Italy), Martin Zettersten (Princeton University, USA), Francis Yuen (University of British

Columbia, Canada), Ingmar Visser (University of Amsterdam, the Netherlands), Claartje Levelt (Leiden University, the Netherlands), Tobias Schuwerk (LMU Munich, Germany), Dora Kampis (University of Copenhagen), Suilin Lavelle (University of Edinburgh)

PRE-CONFERENCE EVENT 2

Advances in infant neuroscience: What state-of-the-art imaging can reveal about the developing mind?

Thursday, 4 January, 8:30-12:30

Organizer:

Barbara Pomiechowska, University of Birmingham

Moritz Köster, Universität Regensburg

Workshop

Pivotal advances in our understanding of the developing human mind have systematically been made possible by progress in experimental methodologies. Cognitive neuroscience has recently seen a great rise of new technologies and data analysis techniques that allow us to study neural processes underlying cognition with ever greater insight. Our workshop aims to introduce a tailored selection of those techniques, best suited for studying infants, to the cognitive development community and place them within the context of brain development during the first year of life. Specifically, we will cover fMRI in awake infants, frequency tagging, decoding and representational similarity analysis. We will discuss how to best use these methods to address and (hopefully answer) deep questions about infant cognition. During a practical session, participants will have the opportunity to brainstorm experimental applications in their areas of research and consult with the experts.

PRE-CONFERENCE EVENT 3

Bayesian models of science learning in Python

Thursday, 4 January, 8:30-12:30

Organizer:

Lucas Lörch, DIPF

Tutorial; limited to 12 participants

Overview and motivation:
Science learning is a highly relevant topic for the investigation of cognitive development. First, misconceptions about scientific phenomena follow a developmental trajectory. Second, science learning depends on metacognitive skills such as inhibition or cognitive reflection, that develop during childhood. Therefore, methods for investigating science learning can provide novel insights into cognitive development. The present tutorial introduces such a method, namely Bayesian modeling of science learning.

Bayesian inference is a method of statistical inference, i.e., a method of drawing conclusions from data. The central notion of this method is Bayes' theorem, which states that the probability that a hypothesis is true given some evidence (P(H|E), called posterior) is proportional to the product of the probability of the hypothesis (P(H), called prior) and the probability that the evidence would occur if the hypothesis were true (P(E|H), called likelihood). While Bayesian inference is a common method in empirical research, it can also be seen as a formalized model of science learning. The learner's prior belief (say, that heavier objects displace more water) is updated after seeing some evidence (say, that a lighter but larger object displaces more water). This approach is supported by previous research (Ullman & Tenenbaum, 2020; Colantonio et al., 2022).

The newly developed Python package "Bayesian Science Learning" (BaSciL) provides an easy-to-use and flexible tool for Bayesian modeling of science learning. It can be used in cases where children learn about scientific phenomena from experimental comparisons. Researchers upload a spreadsheet with information about experimental trials and participants' responses. The program automatically calculates likelihoods and learners' priors, and performs Bayesian updating. Because the functions are pre-built

and run automatically, BaSciL makes Bayesian modeling accessible even to researchers unfamiliar with the Python programming language.

Learning goals:
The aim is that participants...

- understand why Bayesian inference provides a formal model of science learning
- are able to create and upload an input table for the modeling in Python
- know how to execute the package functions to perform the modeling
- can inspect and interpret the modeling output

PRE-CONFERENCE EVENT 4

Python fundamentals for eye-tracking research

Thursday, 4 January, 8:30-12:30

Organizer:
Francesco Poli, Donders Institute for Brain, Cognition, and Behaviour
Tommaso Ghilardi, Birckbeck University of London

Tutorial; limited to 40 participants

Overview and motivation:
Eye-tracking is a technique of fundamental importance for investigating cognitive abilities in infants and children. In the last 20 years, it has revolutionized what we know about the developing mind through unique and clever experimental designs. Yet, a comprehensive guide on how to implement experimental designs and collect eye-tracking data with developmental populations is lacking. This Python tutorial will deliver this knowledge in three ways. First, Python affords unparalleled flexibility, allowing researchers to surpass the limitations of proprietary software. Second, the tutorial aims to establish a standardized, open-access pipeline for eye-tracking data collection and analysis in developmental populations. Lastly, it provides an array of options for deriving eye-tracking measures from raw data, thereby enhancing the adaptability of the research method to the research question at hand.
Learning goals:
Participants will learn: How to implement eye-tracking designs in Python; How to interact with an eye-tracker via Python to calibrate participants' eyes and collect eye-tracking data; How to extract and visualize meaningful eye-tracking measures from the raw data.

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INVITED PROGRAM

INVITED LECTURE 1

Becoming human: How (and how early) do infants link language and cognition?

Thursday, 4 January 2024, 17:45-19:00

Chair:
György Gergely

Presenter:
Sandra Waxman, Northwestern University, USA

Language is a signature of our species. It is the pathway through which we share the contents of our minds across time and space, imagine new ideas and ignite them in others. But how, and how early, do infants begin to traverse this pathway? My goal in this talk is illuminate the developmental origin of this quintessentially human link between language and cognition, and how it unfolds in the first months of life. Even before they can roll over in their cribs, listening to language boosts infant cognition. I'll describe an exquisitely timed developmental cascade, fueled by both 'nature' and 'nurture', permitting prelinguistic infants to discover increasingly precise links between language and cognition, and to use these links to learn about their world.

INVITED LECTURE 2

Uniquely infant social intelligence

Friday, 5 January 2024, 9:30-10:45

Chair:

Ágnes Melinda Kovács

Presenter:

Victoria Southgate, University of Copenhagen, Denmark

The classic Piagetian view of early cognition is that it is egocentric, and evidence suggests that cognitive control is required to overcome an egocentric bias in young children. However, this view is difficult to reconcile with data accumulated over the last decade, indicating that infants readily adopt others' perspectives, and do so despite limited cognitive control. In my talk, I will present a radically different view of infant cognition in which infants are predominantly altercentric and biased to encode information that is the focus of others' attention, sometimes even at the expense of encoding the true state of the world. I argue that this is possible, in part, due to an initial absence of self-representation and propose that this bias will constrain and facilitate infant learning by allowing them to exploit others' information selection at a time when their own ability to act on the world is limited. I will present recent empirical studies from my lab in which we have been testing the various hypotheses derived from this account.

INVITED LECTURE 3

Exploring dimensions of cognition in miniature brains: from concepts, numbers and awareness in honey bees

Saturday, 6 January 2024, 9:30-10:45

Chair:

Gergely Csibra

Presenter:

Martin Giurfa, Institute of Biology Paris Seine (IBPS), Sorbonne University, France

Despite having a 1 mm^3 brain, bees achieve remarkable cognitive feats, which include category and concept learning and non-linear discriminations. They are also capable of numerosity judgments, which include a concept of zero and numerical-distance and numerical-size effects. From three novel explorations of their numeric, symbolic, and learning capabilities, we have found that a miniature brain is not a limitation for mediating relevant cognitive traits such as concept formation, numerosity and awareness. Future research should uncover the neural solutions implemented by bees to achieve these performances and determine similarity and differences with the neural architectures existing in vertebrates. This comparative approach will provide crucial insights to understand the evolutionary origins of cognitive skills.

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SYMPOSIA AND PAPER SESSIONS

SYMPOSIUM 1

INFLUENCES OF AGENCY ATTRIBUTIONS AND RELATED FACTORS ON MORAL CONCERN ABOUT NATURE ACROSS DEVELOPMENT

Thursday 4 January 13:15-14:30

Organizers/Chairs:

Lizette Pizza, Boston University

Deborah Kelemen, Boston University

Speakers:

Lizette Pizza, Boston University

Adena Schachner, UC San Diego

Katja Liebal, LeibzigLab, Children & Nature Project, Leipzig University

Vittoria Sipone, Concordia University of Wisconsin

Amidst pressing concerns about global climate change and debates about the ethical treatment of animals across various industries, questions of whether and when humans establish a moral relationship with nature have become increasingly relevant. Research has shown that humans actively engage in moral reasoning about the natural world (Hussar & Horvath, 2011; Neldner et al., 2018; Wilks et al., 2021), demonstrating a concern for the well-being of plants and animals, even when they do not benefit humans directly. However, significant gaps persist in our understanding of the underlying factors that facilitate this reasoning, as well as the nuanced reasons behind differing levels of moral concern for specific species. Moreover, a crucial issue for further research is whether different factors play similar roles at different points in development. Our symposium therefore addresses two main questions: (1) What are some of the factors that shape individuals' moral reasoning about non-human natural entities? (2) Do these factors similarly impact the reasoning of individuals across different age groups including children, teenagers, and adults?

Paper 1 broadly explores the effects of attributing agency to nature on children's and adults' moral reasoning about the natural world. Findings reveal that mentalistic (mind) and vitalistic (life) agency representations have similar capacities to increase adults' moral concern about environmental harm. They also foster children's learning about nature, in turn enhancing their moral concern and consideration of nature's intrinsic value. Papers 2 and 3 delve even more deeply into agency-related factors that influence moral reasoning

about animals. Paper 2 focuses on an adult sample and explores the impact of attributing musicality to animals. The research finds that ascribing musicality increases recognition of animals' moral standing—an effect that appears mediated by the ways in which musicality heightens perception of animals as intelligent and emotional. Paper 3 then focuses on developmental changes in children's and teenagers' tendencies to grant capacities for thinking versus feeling to different species—agentic attributions that are likely to shape ideas about animals' status within the moral circle. The work finds that across 13 cultures, children show substantial regularity in tending to attribute feelings to animals, with attribution of thought tending to occur in early adolescence. These findings raise questions about when adults' propensities for higher order "mind denial" tend to emerge and what factors contribute to it. Finally, Paper 4 explores the effect of presenting different kinds of factual information about animals (idiosyncratic vs. taxonomic) on the moral reasoning of both adults and children. The research reveals that, in general, either kind of information promotes positive attitudes towards animals. However, idiosyncratic information—possibly because it enhances tendencies to attribute agency to animals—is more effective in promoting intrinsic valuing of living things in relation to environmental issues.

Together these papers provide new insights into the agency-related factors and representations that shape individuals' moral interactions with nature. They also help illuminate potentially effective strategies for promoting nature conservation and sustainability in different age groups.

The Earth is Sick and Unhappy: Attributions of Agency to Nature and their Relationship to Environmental Moral Reasoning in U.S. Adults and Children

Lizette Pizza, Deb Kelemen
Boston University

Correlational research has found that individuals with greater dispositions to attribute agency to nature tend to grant greater moral standing to natural entities (e.g. Waytz et al., 2010). However, no prior experimental research has explored whether this relationship is causal or holds similarly across children and adults. Furthermore, no research has explored potentially differential impacts of distinct kinds of agency representations (e.g. vitalist versus mentalistic).

To address these research gaps, adults (Study 1, N=102) and children (Study 2, N=91) were assigned to one of three conditions where they watched a video about Earth's history. In the Animal condition, the Earth was vitalistically described as a living organism with

physiological needs. In the Person condition, the Earth was mentalistically described as having emotions and desires. In the Control condition, the Earth was described as a physical-mechanical object. Participants then rated their moral concern about various environmental harms (0-3 scale) and provided justifications. Justifications were categorized as biocentric (vs. anthropocentric) if they prioritized the welfare and intrinsic value of non-human nature.

In Study 1, adults in agentic conditions showed greater moral concern about nature than those in the control condition ($p = .043$). They also tended to provide more biocentric justifications ($p = .023$). Patterns in the animal and person conditions did not significantly differ. In Study 2, a main effect of condition did not occur but children who demonstrated they had been actively induced to attribute agency to the Earth showed a mediation effect ($p = .002$). Specifically, these children showed greater learning of Earth's history and, in turn, showed not only greater moral concern but also greater biocentrism. Again, patterns were the same in the animal and person conditions. Implications for our understanding of how different kinds of agency representations operate and for environmental education design will be discussed.

Musicality Changes Moral Consideration of Animals: People Judge Musical Animals More Wrong to Harm

Tanushree Agrawal[1], Joshua Rottman[2], Adena Schachner[1*]

[1]UC San Diego; [2]Franklin and Marshall College; [*]Presenting author

"From early childhood, musical engagement has been found to increase prosociality towards others. Recent work has shown that musical (vs. less-musical) people are seen as more wrong to harm (Agrawal et al., 2023). We test if this effect extends to non-human animals, and whether evidence of animal musicality could promote animal conservation. We propose that evidence of animals' musicality may promote compassion towards them by increasing their moral standing. This effect may be largely indirect, by increasing perceptions of how intelligent and emotionally sensitive they are. Here we characterize adult reasoning; we expect these effects to be early-developing and are currently also testing children.

Across four experiments (N = 550), participants met a host of characters (including distractors, which hid the study's hypothesis), and were asked which of each pairing of characters felt more wrong to harm. These included a crucial matched pair of animals (monkeys), either described as individuals (Exp. 1) or as fictional animal species (Exp. 2-4);

with one described as capable of musical engagement (e.g., bobbing its head and dancing when music is playing), and the other described without mentioning music (descriptions matched for length/style; images/names counterbalanced). Across all experiments, musical animals were judged more wrong to harm than matched neutral animals (all ps < 0.01). Notably, learning that a monkey was musical led people to judge it as equally wrong to harm as human characters (Exp. 1, 2, 4). As predicted, animal musicality was positively associated with perceptions of intelligence and emotionality; These broader factors partially mediated the relationship between musicality and wrongness-to-harm. Participants' judgments did not differ based on their own musicality.

Overall, we find that musicality, a seemingly non-moral attribute, systematically impacts moral decision-making about animals, carrying implications for conservation efforts, and our understanding of socio-moral reasoning about the natural world."

Children's Developing Intuitions About Animal Mind

Katja Liebal, Karri Neldner

LeipzigLab, Children & Nature Project, Leipzig University

An important factor impacting our perceived moral worth of animals is their capacity to experience mental life. Adults tend to grant animals the capacity to feel basic emotions, but deny them complex cognition and sophisticated emotions (Haslam et al., 2008). The tendency to deny mental experience to animals is associated with reduced valuations of moral worth for animals (Knight, Vrij, Cherryman, & Nunkoosing, 2004). However, we know little about when and how children consider the mental experience of animals. To gain a cross-cultural perspective, we examined children's folk theories of animal mind across 13 countries: China, Colombia, Ecuador, Germany, India, Indonesia, Italy, Japan, Namibia, Peru, Switzerland, Syria and Turkey. Preliminary results reveal that, while cultural variation exists in the proportion of children willing to grant thoughts and feelings to animals, children in all communities were more likely to assign capacities to feel to animals, over capacities for thought. Developmental trajectories revealed that children from a majority of communities were willing to grant feelings to animals from an early age (around 4-7 years of age), but that it was only in later years (9 years and above) that children in the majority of communities granted thoughts to animals. These developmental patterns appear to contradict patterns of mind denial prevalent in adult populations, which opens up questions about when children adopt adult-like patterns of mind denial.

Dancing Bees, Singing Whales. The Impact of Idiosyncratic Information on Attitudes Toward and Moral Reasoning about Animals

Vittoria Sipone[1], Chris Lawson[2]

[1]Concordia University of Wisconsin; [2]University of Wisconsin Milwaukee

The present study investigates how knowledge of and affinity for nature interact. The study, involving 70 children aged 4-10 and 45 adults, focuses on the impact of different types of information on attitudes and care toward animals, specifically idiosyncratic information – unique and novel facts that have potential cognitive benefits and prevalence in daily life. Participants underwent a virtual interview, evaluating their attitudes toward four target animals. Subsequently, they were provided with either taxonomic or idiosyncratic information about these animals. After receiving the information, their attitudes were reassessed. Additionally, participants faced an environmental moral dilemma involving potential harm to the target animals and were asked whether they found such actions acceptable and why.

Two main predictions were tested. Firstly, that idiosyncratic facts would lead to more positive attitudes than taxonomic facts. Indeed, the results demonstrated an overall increase in positive attitudes toward animals after receiving information, with idiosyncratic facts having a stronger impact. When comparing results across age groups, we found that the effects of both taxonomic

and idiosyncratic information influenced adults' attitudes toward the target animals, but that was not the case for children. Secondly, the study expected idiosyncratic facts to influence moral reasoning differently from taxonomic facts, particularly by encouraging biocentric reasoning. However, this hypothesis was not supported, nor were developmental differences found. Instead, the findings revealed that participants generally leaned towards biocentric justifications. Notably, however, those who developed positive attitudes upon receiving idiosyncratic information showed higher rates of biocentric reasoning, indicating a connection between attitudes and moral deliberation. While the expectation of distinct effects on moral reasoning between idiosyncratic and taxonomic information was not confirmed, the overall positive impact of information on attitudes and the interconnectedness of attitudes with moral reasoning were prominent outcomes of the study.

PAPER SESSION 1

KNOWLEDGE

Thursday, 4 January 2024, 16:30-17:30

Chair:

Anna Kispál

Shall I trust you? Children's vigilance towards others' gullibility

Marie Aguirre[1], Thomas Castelain[2], Nausicaa Pouscoulous[3], Diana Mazzarella[1]

[1]University of Neuchâtel; [2]Universitat de Girona; [3]UCL

Much research in developmental psychology shows that children do not blindly trust their sources of information and display strong selectivity in whom they trust, a capacity named 'epistemic vigilance' (Sperber et al., 2010). However, little is known of whether children track other's epistemic vigilance and are thus sensitive to the vigilance/gullibility of their informants. The present study investigated the emergence and development of children's capacity to track others' epistemic vigilance towards deception to orient their trust choices ('second-order vigilance', Mazzarella & Pouscoulous 2021).

This study examines first- and second-order vigilance toward deception in early and middle childhood. In our second-order vigilance task, children were first exposed to a partner who faced multiple trust choices between a benevolent informant and a malevolent one. We manipulated the vigilance of the partner, who systematically trusted the benevolent informant (Vigilant condition) or systematically trusted the malevolent informant (Gullible condition). We then tested children's propensity to accept information from the same partner in a situation in which the partner's testimony was based on the advice of the malevolent and benevolent informants (not audible by the child). Display of second-order vigilance was expected to lead to higher trust rates in the Vigilance condition than in the Gullible one.

We tested four- to seven-year-olds (N = 225) and adults (N = 60), in three sessions involving different manipulations of the benevolence/malevolence of the informants: a moral (mean/nice), an epistemic (always tells lies/the truth), and an intentional characterization (wants/does not want to help). Our findings on first-order vigilance were in line with previous literature (Mascaro & Sperber, 2009). Results concerning second-order vigilance revealed that children are sensitive to the vigilance/gullibility of their partner from the age of 4. However, across all age groups, children displayed a strong tendency to trust their partner, in both Vigilance and Gullible conditions.

Do disagreements stimulate exchange of reasons?

Hanna Schleihauf[1], Antonia Langenhoff[2], Zhen Zhang[3], Henriette Zeidler[4], Bahar Köymen[5], Esther Herrmann[6], Jan Engelmann[2]

[1]Utrecht University; [2]University of California, Berkeley; [3]Chinese Academy of Science; [4]Aston University; [5]University of Manchester; [6]University of Portsmouth

Disagreements can be solved either competitively – by using force or dominance – or cooperatively – by using reasons. The present study explores the use of reason-giving among children in the context of conversations involving (a) disagreements and (b) agreements. The research was conducted across three distinct cultural environments – Kenya, the United States, and China.

We engaged dyads of children, ranging from 5 to 9 years old (N=180), who were of the same sex and age, to participate in a decision-making task. In one scenario, the participants were presented with conflicting evidence relevant to the problem at hand: one child saw that rewards were hidden in a blue box, while the other child was informed that the rewards were concealed in a red box. In another situation, they received corroborating evidence: one child saw that the rewards were hidden in a blue box, and the other child was told that the rewards are in the same blue box. Then, children could jointly decide which box to select. We measured whether they exchanged reasons to convince their partners of their choice. Our hypothesis postulated that as children mature, they would progressively share more reasons. Furthermore, we proposed that children would be more prone to exchanging reasons in situations of disagreement compared to agreement.

Our preliminary findings hint at cultural variances. In Kenya and the United States, reason-giving increased with age, but surprisingly, it declined in China ($X2(2) = 6.658$, $p = .036^{*}$). Additionally, while disagreements promoted a more robust exchange of reasons in the United States and China, the nature of the discussion - disagreement or agreement - had no bearing on the exchange of reasons of children in Kenya ($X2(2) = 5.365$, $p = .068^{\dagger}$). We interpret these findings in the context of cultural norms of respect and politeness.

Investigating deliberate ignorance in children and adults

Francesca Bonalumi, Azzurra Ruggeri

Central European University

People's motivation to gain knowledge and learn has attracted the attention of researchers across various fields. However, the motivation not to know and not to learn is much less

investigated. While adults have been found to deliberately avoid seeking information as a strategic or as emotion-regulation device (Hertwig & Engels, 2016), we do not know much about the emergence of deliberate ignorance, and what influences children's decisions about deliberately ignoring a piece of information.

In two studies we investigate whether children and adults systematically prefer to ignore potentially unpleasant information. We presented participants with short stories illustrating a social situation with an agent who could be responsible for a misdeed (e.g., 'your favorite toy was broken'). Would the participant want to know what happened? We measured children and adults' choices to (not) know about the misdeed both in the absence or in the presence of the agent.

We found that children (N = 269, Mage = 10.65) are more inclined to choose to ignore whether the agent is responsible for the misdeed when the value of the information at stake is low (GLMM, $z = 3.75$, $p < .001$); interestingly, when assured that the agent will never know about their enquiry, children chose to know more often when the potentially responsible agent is described as a bully (GLMM, $z = 2.68$, $p = .007$), whereas they chose to ignore more often when the responsible agent is a friend (GLMM, $z = -2.41$, $p = .02$). Similarly, adults (N = 189, Mage = 21) manifested a comparable decision pattern.

This project is a first explorative contribution showing that children's deliberate decisions to ignore potentially unpleasant information are modulated by information value and by the relationship frame proposed, suggesting a rational approach to ignorance.

PAPER SESSION 2

NUMERICAL COGNITION

Friday, 5 January 2024, 11:15-12:15

Chair:

Barbu Revencu

Does language shape children's understanding of numerical concepts?

Akshita Srinivasan[1], Simge Topaloglu[1], Kexin Que[2], Çiğdem İleri[3], Aylin Küntay[3], Stella Christie[2], Jesse Snedeker[1], Elizabeth Spelke[1]

[1]Harvard University; [2]Tsinghua University; [3]Koç University

Languages vary in how transparently they reveal the compositional structure of the base-10 number system. "Eleven" in English does not convey that it is composed of ten and one, whereas in Mandarin, "eleven" is expressed as "ten one". Past work has shown that English-speaking children fall behind their age-matched peers who speak languages like Mandarin in counting and base-10 tasks (Ho & Fuson, 1998, Miller et al., 1995,). However, cultural and educational practices covary with linguistic differences, and past work attempting to disentangle these factors yielded mixed results (Dowker et al., 2008, Vasilyeva et al., 2015). The present study asks: 1) Whether the location of non-transparent number words in the count list affects numeracy acquisition? We compare Turkish (with transparent teens and non-transparent decades) to English (with non-transparent teens) 2) Are there differences in numeracy acquisition between Indian children from similar SES and educational backgrounds who speak either a relatively transparent (Tamil) or a highly non-transparent (Hindi) language? In our preregistered study, we recruit 620 (124 each in English, Turkish, Mandarin, Tamil, and Hindi) 3-7-year-old children who complete verbal counting and base-10 tasks. Complete data from Mandarin, English, and Turkish indicate that Mandarin-speaking children outperform English-speaking children, who in turn outperform Turkish-speaking children in both tasks at all ages. While this seems to suggest that non-transparent decades are a bigger impediment than non-transparent teens, the gap between Turkish and English speakers appears at the earliest stages of number word learning, suggesting that it might be attributable to other cultural or linguistic differences. Data collection for Tamil and Hindi is 87% complete. If language shapes numeracy acquisition in children with similar SES and educational backgrounds, then Tamil-speakers should outperform Hindi-speakers. By studying novel languages across

wide age-ranges, we examine the relationship between language and the development of compositional concepts.

Geometric content of visual forms representations in children and adults

Léa Lefer[1], Penelope Maran[1], Judith Vergne[1,2], Lucie Martin[1], Ana Duron[1], Théo Morfoisse[1,3], Viviane Huet[1], Maxine Dos Santos[1], Véronique Izard[1]

[1]Université Paris Cité, INCC UMR 8002, CNRS, Paris, France; [2]Laboratoire de Psychopathologie et Processus de Santé, Université Paris Cité; [3]Cognitive Neuroimaging Unit, INSERM, CEA, CNRS, Université Paris-Saclay, NeuroSpin

Geometry describes concepts than can be realized in space, and may thus be grounded in perception. Here, we analyze the geometric content of 2-dimensional visual form representations, in children and adults spanning a large range of ages from 3 to 80 years (N=1319). To analyze geometric content, we use Klein's Erlangen program, a framework unifying major mathematical theories of geometry and ordering them by degree of abstraction. One of the geometries of Klein's framework is scale-free Euclidean geometry, which describes figures in terms of their proportions and angles, ignoring variations in position, orientation or size. The other geometries are either more abstract than Euclidean geometry (e.g. Projective geometry would ignore the differences across shadows projected by a same contour) or less abstract (e.g. Identity geometry would consider two figures to be different even if they are related by a simple rotation). In a first study, participants (age 6+) were able to locate oddballs defined in terms of each geometry, hence indicating that perception has access to all the geometries in Klein's framework. Next, we asked whether all these detectable differences enter into people's intuitive concept of shape/form*. New groups of participants (age 3+) were presented with panels of forms instantiating different levels of geometric equivalence, and were asked to judge whether these shape/forms were ""the same"" or ""different"". We found that all geometries were implicated in participants' intuitive concept of shape/form, at all ages. However, while preschoolers initially used all the geometries to the same extent, older children successively dropped the most abstract geometries, then the lower-level geometries, to finally privilege scale-invariant Euclidean geometry as teenagers and adults. These findings challenge the idea that Euclidean geometry may be the natural geometry of the human mind.

*In French, a single lexical item (""forme"") covers the two English words ""shape"" and ""form"".

From symbols to concepts: Learning numerals changes numerical thinking

Jenna Croteau, Joonkoo Park
University of Massachusetts Amherst

The origin of natural number concepts in human thought has been the focus of much intellectual inquiry. This interest stems from two facts: 1) precise number concepts appear to be uniquely human and 2) number concepts are abstract yet well-defined, making them empirically tractable. These facts make the acquisition of number concepts a wedge into the question of how uniquely human knowledge develops. In this talk I argue that early small number concepts are not abstract until the acquisition of numeral systems (e.g., complex numerical syntax, Arabic notation). To build this argument, I present novel empirical evidence from three experiments. Experiment 1 demonstrates that prior to acquiring number words, 14- to 23-month-old babies (n=35) do not represent small numbers analogically unlike previous claims of abstract individuation of one to three items. Experiment 2 presents evidence that prior to the acquisition of complex numerical syntax, 3.5- to 8-year-old English speaking children (n=40) systematically misinterpret the meaning of number words to represent same kind sets as opposed to abstract numerical quantity. Finally, Experiment 3 presents evidence that 4- to 8-year-old English speaking children (n=311) are largely primed by the syntax of a probe numeral (either Arabic or verbal) when asked to generate a larger number. This indicates that symbolic format of a numeral exudes a strong effect on how children think about that number. Together, these experiments suggest that it is not until children master the written and verbal numerals in their culture that children understand numbers in a way that is both abstract and uniquely human. If true, these results indicate that the pedagogical transmission of symbolic systems is one major mechanism in the development of uniquely human knowledge.

SYMPOSIUM 2

HOW COGNITION DEVELOPS IN SOCIAL CONTEXTS

Friday 5 January, 13:15-14:30

Organizer/Chair:
Joshua Confer, UC Berkeley

Speakers:
Joshua Confer, UC Berkeley
Marlene Meyer, University of Göttingen
Trisha Katz, Duke University

Children's developing cognition is often studied in individual, non-social contexts. This body of research has given rise to the "child as scientist" metaphor which characterizes children as open-minded, flexible, and curious learners who test alternative hypotheses to rationally form and revise their beliefs. In reality, of course, neither cognitive development nor scientific research is an individual activity. Both activities take place in highly social settings. Yet, how different social contexts facilitate or impede cognitive development is not well understood. In this symposium, researchers from three international labs investigate three key aspects of cognitive development – belief formation and revision, metacognition, and impression management – in various social environments.

The first contribution investigates whether group membership biases how children evaluate evidence. A first study reveals a minimal group effect on children's belief formation practices: 4-6 year-old children who are assigned to a group adjust their standards of evidence – they lower their evidentiary threshold – to adopt group beliefs. A second study shows a minimal group effect on children's belief revision practices: 4-6 year-old children who were assigned to a group again adjusted their standards of evidence – this time they increased their evidentiary threshold – when they encountered evidence that contradicted what their group believed. Across both studies, children who were not assigned to a group evaluated the evidence in a more rational way and as a result formed more accurate beliefs.

The second contribution studies children's developing metacognitive abilities in a dyadic social context. Although theorists have argued that explicit metacognition serves communicative functions, most prior research has studied children's metacognition in non-social contexts. Across three studies, the authors find that already 3-year-old children – who consistently fail to demonstrate metacognitive abilities in standard, non-social paradigms

– demonstrate competence when the task is embedded in a social context. Specifically, both 3- and 5-year-old children expressed their uncertainty (using both direct and indirect measures) when a conversational partner asked them for advice in a cooperative task.
The third contribution focuses on children's developing understanding of their own and others' reputation. The results of a first study suggest that even 4-year old children possess advanced theory of mind skills to infer what kinds of communicative decisions best serve their reputational interests. Specifically, the findings reveal an early emerging understand that the sharing of prosocial acts can positively influence others' evaluations of the self. A second study probes children's reciprocal attitudes towards those who have benefited their reputation. 5-year-old children, but not 3-year olds, systematically demonstrate more positive evaluations of partners who improve their social standing.
Collectively, this symposium illuminates key pathways through which various social environments influence children's cognitive development. Our discussant, an internationally renowned expert on cognitive development, will provide an integrative synthesis, highlighting different theoretical frameworks and illustrating how the "child as scientist" metaphor can be fruitfully extended by considering the social nature of cognitive development.

Group membership biases how children evaluate evidence

Joshua Confer[1], Hanna Schleihauf[2], Dorsa Amir[1]
[1]UC Berkeley; [2]Utrecht University

Why do people hold irrational beliefs, even when there is ample counterevidence? One important reason is that we are group-minded (Williams, 2021). People jump to conclusions to hold their groups' beliefs and are more skeptical of holding other groups' beliefs. In the current project, we examine the developmental roots of this group bias, assessing how group membership affects children's belief formation practices. Previous research suggests young children rationally form and revise their beliefs according to the available evidence (Kushnir & Gopnik, 2005; Bonawitz et al., 2012; Lucas et al., 2014; Kimura & Gopnik, 2019). However, we find that in group-based contexts, 4-6-year-olds already bias their standards of evidence to adopt group beliefs. In two preregistered studies (N=140), children were first assigned to one of two groups (Group Condition), or simply introduced to two groups (No Group Condition). Then, children solved a reasoning task to figure out whether there were more elephants or lions in a series of boxes. Before being able to test evidence, children learned what both groups believed about the boxes. In Study 1, children

in the Group Condition preferentially formed their ingroup's belief about the boxes and tested less evidence when the evidence supported what their group believed. In Study 2, children in the Group Condition were more resistant to revising their group beliefs about the boxes after finding evidence that opposed this group belief. In both studies, children in the No Group Condition evaluated evidence in a more rational way. Taken together, this suggests the process of biasing our evidentiary standards to hold group beliefs is early emerging and these findings shed light on the mechanisms underlying children's belief formation practices more generally.

Social Metacognition – Effects of a social test context on young children's metacognitive insight

Marlene Meyer[1], Marina Proft[1], Lydia Paulin Schidelko[1], Hannes Rakoczy[1], Jan Engelmann[2]
[1]University of Göttingen; [2]UC Berkeley

Being able to explicitly acknowledge their own uncertainty marks a milestone in children's metacognitive development. Interestingly, prior research suggests that children fail to do so before the age of 6. Instead, especially under so-called partial ignorance, they incorrectly claim to know, e.g., which one of several objects is hidden inside a box (e.g., Rohwer et al., 2012).

However, these experiments typically neglect the pivotal claim that metacognition serves social functions in human interaction and cooperation (e.g., Shea et al., 2014; Heyes et al., 2020). This raises the question whether previous findings have underestimated children's metacognitive abilities due to non-social test contexts.

To address this, we introduce a social paradigm for the standard partial ignorance task. In three studies (N = 162), children cooperated with a second experimenter (E2) to identify which one of three animal was hidden inside a box. Importantly, instead of facing an academic test question from E1 in an individual context, the social paradigm embedded the crucial question within this cooperative and communicative interaction with E2, who indeed relied on the children's answer.

Contrary to previous research, we found that most 3- and 5-year-olds expressed their uncertainty, either implicitly or explicitly, in response to E2's test question (Study 1, N = 66, "Can you tell me which animal it is?"). Notably, this finding holds when considering only explicit ignorance acknowledgments in response to a more direct question (Study 2, N = 64, 3- and 5-year-olds, "Do you know which animal it is?") and when controlling for alternative explanations like reduced working memory demands (Study 3, N = 32, 3-year-olds).

These results support the hypothesis that a social test context enhances children's metacognitive abilities and will be discussed in light of the close relationship between metacognition and the communicative and cooperative character of human social interaction and cognition.

Preschoolers' Emerging Cognitive Capacity to Understand and Shape Their Own and Others' Reputations

Trisha Katz, Michael Tomasello
Duke University

As children develop and become immersed in a complex social environment, they soon realize they are being evaluated. This awareness soon brings about a desire to influence or change the impressions others hold. We report several studies concerning children's knowledge of what information can either positively or negatively influence one's reputation. In our first study, 4-year-old children had the opportunity to inform a social partner of either a prosocial act they had engaged in or a merely instrumental act, depending upon condition. Children in this study also had the chance to protest a mistaken individual who assigned credit for the act incorrectly. We found that children in the prosocial condition were more motivated to inform others of the act and to protest when someone else received credit. We believe these results reflect an early awareness that prosocial actions can foster favorable impressions. In a separate study, we explored whether children will be less likely to tattle, that is, hurt someone's reputation, when that individual had previously given them undue credit for a prosocial act (reciprocity condition). This was compared to the control condition where the child had no reason to feel indebted (control condition). Results showed that 5-year-olds in the reciprocity condition were less likely to tattle and more likely to lie and take the blame for their transgressing partner than children in the control condition. The results for 3-year-old children trended in a similar direction but did not reach significance. These findings demonstrate that children reward individuals who support/improve their social standing. Lastly, ongoing work explores whether children are more motivated to show off that they are highly competent or highly prosocial, and if they are willing to pay a cost to advertise these traits. Altogether, the abilities present throughout these studies are critical to children's developing social competence.

PAPER SESSION 3

CROSS-CULTURAL RESEARCH

Friday, 5 January 2024, 16:30-17:30

Chair:

Laura Schlingoff

Crying Hot Tears: Investigating Infants' Responses to Emotional Stimuli Using Thermal Imaging

Carlo Vreden[1], Elizabeth Renner[2], Eunice Murokore[3], Zanna Clay[1]

[1]Durham University; [2]Northumbria University; [3]Kabale University

Contagious crying in infants has been considered an early marker of their sensitivity to others' emotions, a form of emotional contagion which may represent an early basis for empathy. However, it remains unclear whether infant distress in response to peer distress is due to the emotional content of crying or its aversive acoustic nature. Additionally, research on early emotional sensitivity remains severely biased towards Western samples from Europe and North America, which are not representative of global trends. In this study, we address both aspects by employing the novel and non-invasive method of infrared thermal imaging, in combination with behavioural markers of emotional contagion, to measure emotional arousal during a contagious crying paradigm in a cross-cultural sample of 10- to 11-month-old infants from rural and urban Uganda and the UK (N = 313). Infants heard social stimuli of positive, negative, and neutral emotional valence (infant laughing, crying, and babbling, respectively) and a non-social acoustically matched artificial aversive sound. Results revealed that changes in infant nasal temperature were larger in response to crying and laughing compared to the artificial aversive sound, and larger for crying than for babbling. Behavioural reactivity was also greater for crying than for the artificial stimulus, as well as for crying than for laughing. Overall, by employing the non-invasive technique of thermal imaging with a large and culturally diverse sample, our results support the view that infants within the first year experience emotional contagion in response to peer distress, an effect which is not just explained by the aversive nature of distress vocalisations. Sensitivity to other's emotional signals in the first year of life may provide the core building blocks for empathy.

From understanding to action: how socio-cultural learning environments affect a key prosocial transition in infants

Georgia Tuohy[1], Carlo Vreden[1], Elizabeth Renner[2], Eunice Murokore[3], Moritz Koster[4], Zanna Clay[1]

[1]Durham University; [2]Northumbria University; [3]Kabale University; [4]Universität Regensburg

By 10 months of age, infants exhibit an intrinsic understanding of others' needs. However, this apparent prosocial understanding only predicts future helping behaviour when developing motor and social skills are considered. This suggests that the ontogeny of helping behaviour relies on a complex interplay of developmental processes.

Here, we examined the mechanisms which allow infant helping behaviour to emerge amongst a diverse sample of infants in the UK and rural and urban Uganda, with a focus on the socio-cognitive factors that might catalyse prosocial understanding into prosocial action.

Uganda provides an interesting backdrop to studying prosocial development as compared to infants in Western industrialised settings, the typical Ugandan learning environments may allow for more opportunities for socio/cognitive and motor skill learning. Thus, the emergence of prosocial behaviour in infants in Uganda may differ in its trajectory from that of typically sampled Western populations.

We addressed this by longitudinally sampling a large cohort of infants in rural and urban Uganda (approx. N= 250) along with a comparison group in the UK (N= 50). At 10 months, infants engaged in an eye-tracking task to establish cognitive need understanding and at 16 months, they participated in a classic out-of-reach helping task as well as motor and socialisation tasks.

Results found that the ability to understand needs predicted later helping behaviour. However, no differences were found across sites in needs understanding or motor skills although the relationship amongst predictors varied across sites. These results support the theory that while humans may have a biologically rooted prosocial tendency that is present in the first year of life, the socialisation of prosocial behaviour may differ across socio-cultural learning environments.

A longitudinal cross-cultural investigation of effects of maternal infant directed speech on infant language development in UK and Uganda

Ellie Donnelly[1,2], Edmund Donnellan[3], Santa Atrim[4], Joanna Buryn-Weitzel[1], Nesta Gune[4], Kirsty E Graham[5], Maggie Hoffman[6], Eve Holden[5], Michael Jurua[4], Charlotte V Knapper[1], Nicole Lahiff[7], Sophie Marshall[1], Josephine Paricia[4], John Sajabi[4], Georgia Tuohy[2], Florence Tusiime[4], Carlo Vreden[2], Claudia Wilke[1], Zanna E Clay[2], Katie E Slocombe[1]

[1]University of York; [2]Durham University; [3]University College London; [4]Budongo Field Conservation Station; [5]University of St Andrews; [6]Arizona State University; [7]University of Zurich

Infant-directed speech (IDS) is a special speech register which is typically slower-paced, higher-pitched, higher in emotional affect, with a greater pitch range and larger vowel space than adult-directed speech (ADS). Such acoustic differences draw infants' attention to the speech (Senju & Csibra, 2008), potentially facilitating infant language learning (Kuhl, 2004). In particular, IDS quantity and vowel hyperarticulation positively predict language outcomes (Dilley et al., 2020; Hart & Risley, 1995). However, longitudinal evidence investigating the effects of the acoustic qualities of IDS on infant language development remains sparse. In addition, most studies have been conducted in Western, industrialised societies using small sample sizes or methodology that has since been questioned (Masek et al., 2021). Here, we address these issues by examining cultural variation in acoustic features in maternal IDS and ADS (mean pitch, pitch modulation, vowel hyperarticulation, emotional affect) and IDS quantity at 3-10 months in UK (N = 129) and Ugandan (N = 96) mothers. Second, we test if acoustic features or IDS quantity in the first year of life predicts infant expressive and receptive language at 15-18 months (N = 115 UK; 85 Ugandan). We used free play videos to measure the proportion of time mothers produced IDS. For IDS and ADS acoustic features we asked mothers to talk to their infants and a local adult experimenter and to name objects to elicit the corner vowels /a/, /i/ and /u/. Emotional affect content of IDS and ADS clips were measured using an average listener-rating of filtered speech that removed semantic content. Expressive and receptive language outcomes were measured using the 100 word Oxford CDI for UK participants and translations of the Kiswahili CDI (Alcock et al., 2015) into Ugandan Swahili, Alur and Lugbara for Ugandan participants. Results of statistical models will be presented and implications of the results discussed.

PAPER SESSION 4

COMPARATIVE COGNITION

Friday, 5 January 2024, 17:45-19:05

Chair:

Maria Mavridaki

Assessing capacities for basic reflective thinking in 2-year-olds, dogs and pigs

Kirsten Blakey[1], Eva Rafetseder[1], Zsófia Virányi[2], Ariane Veit[2], Kea Amelung[2], Kinga Kovacs[2], Franziska Freudensprung[2], Giacomo Melis[1]

[1]University of Stirling; [2]Messerli Research Institute, University of Veterinary Medicine Vienna, Medical University of Vienna, University of Vienna, Vienna, Austria

Some philosophers maintain that reflection, the ability to assess one's reasons for beliefs and actions, is the defining feature of rational thinking. However, they also tie reflective thinking to linguistic abilities ruling out human infants and non-human animals. To assess capacities for basic reflective thinking, which does not require language, we investigated whether 2-year-old children, dogs or pigs could reflectively revise their beliefs about the reliability of two different informants. In an object-search task the informants hid rewards using three different actions. The actions of one of the informants reliably indicated the reward location, while the actions of the second informant were unreliable, only indicating the reward location in 50% of trials. Each informant used three different actions to hide the rewards. This put subjects in the position to make generalisations about the reliability of the evidence provided by each informant. We found that neither 2-year-olds nor non-human animals responded differently to the unreliable informant compared to the reliable one. Rather, children became less likely to follow the indications of either informant in later trials whereas animals continued to follow the cues of both informants at the same rate. These results provide no evidence that minimally verbal children, pigs, or dogs made a generalisation about the reliability of each informant across the different hiding actions. Therefore, it remains an open question whether infants, pigs and dogs are capable of basic forms of reflective thinking.

Guinea baboons (Papio papio) show a preference for agents in chasing interactions

Floor Meewis, Joël Fagot, Nicolas Claidière, Isabelle Dautriche
CNRS, Aix-Marseille University

Languages tend to describe who is doing what to whom by placing agents before patients. This preference for agents is reflected in cognition: agents are recognized faster and capture more attention than patients in both human adults and infants. We investigated whether this agent bias is uniquely human or shared with non-human animals. Chasing animations in which one object (the chaser/agent) chases another that flees away (the chasee/patient), have been previously used to look into the processing of events and event roles. During a chasing event, human adults and infants show an attentional preference for the chaser/agent. In the current, pre-registered study we presented Guinea baboons (Papio papio) with a change detection paradigm with simple 2D chasing animations. The baboons were trained to respond to a colour change which was applied to either the chaser (agent) or the chasee (patient). The baboons (N = 13) were faster to detect a change to the chaser than to the chasee in the chasing interaction. This faster response cannot be explained by a preference for low-level features such as the chaser's motion pattern or the fact that the chaser moved behind the chasee, as we did not observe this bias in our control conditions. Our study thus suggests that Guinea baboons are sensitive to the event roles of agent and patient in chasing interactions and that they show an attentional preference for the agent. This points to similar event processing in Guinea baboons as has been previously shown for human adults and infants. Event parsing with an agent preference may be an evolutionarily old mechanism which is shared between humans and other non-human primates, which may have become externalised in human language as a tendency to place the subject first.

Visually naïve chicks are sensitive to motion patterns of agent interactions

Orsola Rosa-Salva[1], Mikolaj Hernik[2], Bastien S. Lemaire[1], Mirko Zanon[1], Elena Lorenzi[1], Giorgio Vallortigara[1]
[1]University of Trento; [2]Arctic University of Norway

The early social responses of visually naïve domestic chicks have long been studied in a comparative perspective to those of human infants, to reveal whether mechanisms known in babies are present in naïve organisms. Similar to newborns, chicks have inborn

preferences for objects with the typical motion of animate agents (e.g., self-propelled and semi-rigid biological motion, or motion along the body's main symmetry axis).
When the movements of multiple objects show certain forms of interdependence, humans perceive the presence of social interactions and goal-directed behaviours. In a first set of studies, we investigated chicks' responses to agents whose motion was reciprocally contingent in space and time (i.e., the motion of one object can be predicted from that of another object). Chicks preferred stimuli in which the timing of the motion of one object could not be predicted by that of other objects, compared to highly predictable motion sequences. In a second set of studies, we tested chicks' responses to the so-called "wolf-pack" displays. This revealed a spontaneous preference for stimuli, where several randomly moving elongated triangular objects (the wolves) always orient their tips towards a randomly moving disk, compared to stimuli in which the wolves are rotated by 90 degrees and thus always give their flank to the disc. Overall, these studies provide the first demonstration of sensitivity to the spatiotemporal relationships between the motion of different objects in naïve animals. A trait that could be the basis of the perception of social interaction and goal-directed behaviours.

Eavesdropping in dogs: Dogs with a vocabulary of object labels can learn new labels by observing social interactions

Shany Dror, Ádám Miklósi, Andrea Sommese, Claudia Claudia Fugazza
Eötvös Loránd University

18-month-old infants can learn words by observing 3rd-party interactions. Label learning by observation has also been demonstrated in a few individual grey parrots and bonobos. Word-knowledgeable (WK) dogs learn object labels (e.g., dog toy names) by engaging in playful social interactions with their owners. To examine whether WK dogs also learn object labels by observing 3rd-party interactions, and how this compares to their typical learning context, we exposed WK dogs (N=9) to two conditions. In the Observational Learning Condition (OLC), dogs observed two of their owners as they engaged in a triadic interaction with a toy. One of the owners repeatedly named the toy, gave it to the other owner, and asked them to hand it back. While doing so the owners looked at each other and at the toy in an ostensive manner, but not at the dog. These one-minute-long interactions were repeated for 4 days, after which the process was repeated with a second toy. In the Active Learning Condition (ALC), dogs were exposed to the same process but instead of observing the owners, one of the owners played with the dog with the toy. To test the

learning outcome, after the completion of each condition, both of the new toys were placed together and the owner asked the dog to retrieve each toy six times, in a semi-random order. The dogs' performance did not differ between conditions (Wilcoxon matched pairs test, $p = 0.248$). In each condition, 6 out of 9 dogs performed significantly above chance (binomial test; chance level = 0.5, $p \leq 0.02$). These results show that WK dogs can learn labels after only eight minutes of exposure and by observing 3rd-party interactions.

PAPER SESSION 5

LANGUAGE AND SYMBOLIC REPRESENTATION

Saturday, 6 January 2024, 11:15-12:15

Chair:

Rachel Dudley

Not a pipe: 15-month-olds accept arbitrary objects as symbols for familiar kind tokens

Barbu Revencu[1], Barbara Pomiechowska[2], Gabor Brody[3], Gergely Csibra[1]

[1]Central European University; [2]University of Birmingham; [3]Brown University

Many forms of human communication, such as pretend play, puppet shows, diagrams, or animations, involve visual objects (symbols) used to stand for entities under discussion (discourse referents). Often, what the symbols stand for cannot be retrieved from their visual or behavioral features. In these cases, the conceptual identity of the discourse referents can be conveyed via linguistic stipulation (e.g., map legends, object substitution pretense). Across three experiments, we show that 15-month-old infants understand (i) that visual objects can be used as symbols and (ii) that language can be used to define the conceptual identity of the discourse referents. Experiment 1 shows that 15-month-old infants map arbitrary visual symbols (e.g., a triangle) onto discourse referents belonging to familiar kinds (e.g., a duck) based on predicative expressions (e.g., “Look! A duck!”). Experiment 2 shows that infants restrict the mapping to the speaker who stipulated it. This rules out alternative hypotheses according to which infants take such stipulations literally (e.g., that the speaker means that triangles are ducks). Experiment 3 shows that infants recruit their conceptual knowledge when interpreting subsequent events involving the symbols. If infants are told that one symbol stands for an agent (e.g., a duck) and another symbol stands for a patient (e.g., a spoon), infants prefer when the agent symbol moves towards the patient symbol rather than the other way around. This rules out the alternative hypothesis that infants think the speaker has an idiosyncratic vocabulary (e.g., that the speaker uses “duck” to refer to triangles). Taken together, the results show that the cognitive mechanism underlying the interpretation of symbolic relations is easily activated and available early in human ontogeny.

Can someone really fall in despair?: Facilitating children's processing of metaphors through Theory of Mind training

Fatma Nur Öztürk, Duygu Özge
Middle East Technical University

Given evidence indicating a link between the capacity to comprehend others' mental states and the processing of metaphors in middle childhood(Happé,1993) and adultho od(Rossetti,Brambilla,&Papagno,2018), questions arise as to (i) whether such a positive relationship is observed in younger children and (ii) whether training Theory of Mind (ToM) abilities would prime/facilitate metaphorical processing in preschoolers. This study aims to investigate these questions with 4- and 5-year-old Turkish-speaking children in a randomized controlled design focusing on metaphorical motion events (e.g.,'falling in despair,''going into raptures').

During a 6-week intervention program, an experimental group (N=44) was engaged in a ToM training modeled after(Ornaghi,Brockmeier,&Gavazzi,2011), which involved stories and games designed to enrich children's mental state vocabulary and reasoning, while a control group (N=28) participated in neutral story-book reading and free-play activities. All participants were pretested and posttested with linguistic and cognitive measures. To counteract potential interference from children's limited verbal abilities on their metaphorical performance(Pouscoulous&Tomasello,2020;Vosniadou&Ortony,1983), we combined a gesture-based act-out task(Hülagü&Özge,2017) with a verbal explanation task(Özçalışkan,2005).

Separate regression analyses revealed that (i) first-order (but not second-order) ToM predicted metaphorical comprehension in both gesture-based (β=−0.51,SE=0.15,p<.01,OR =0.60,97.5%CI[0.44,0.81]) and verbal (β=−0.69,SE=0.15,p<.001,OR=0.51,97.5%CI[0.38,0.69]) tasks, (ii) first-order ToM training improved ToM abilities (β=−0.64,SE=0.07,p<.001,OR=0.5 3,97.5%CI[0.46,0.60]), and (iii) this training indeed increased the likelihood of metaphorical gestures (β=2.07,SE=0.38,p<.001,OR=7.95,97.5%CI[3.81,16.60]) and explanations (β=2.1 4,SE=0.34,p<.001,OR=8.54,97.5%CI[4.39,16.59]) in children, with no age-related effect.

Regarding the positive link between ToM and metaphorical processing, our findings confirmed the previously observed link for older populations also for children as young as 4. Concerning the transfer effect, we showed that ToM training facilitated not only ToM abilities but also metaphorical processing/reasoning skills of our participants. To our knowledge, this is the first study to demonstrate a transfer effect from a cognitive domain to a linguistic/pragmatic one, highlighting the significance of incorporating such interventions as valuable strategies to enhance linguistic and cognitive processing in educational/clinical settings.

Really, he dased the cat to the boy? Two-year-olds exploit grammatical and thematic content to learn novel verb meanings

Giulio Massari[1], Vincenzo Moscati[1], Anne-Caroline Fiévet[2], Alex de Carvalho[3]

[1]Università degli studi di Siena; [2]École Normale Supérieure - PSL; [3]Université Paris Cité

Infants exploit the syntactic context verbs appear in to guide verb learning (e.g., Gleitman, 1990). For instance, 2-year-olds interpret a novel verb like 'blicking' as referring to a causal event between two participants when listening to transitive sentences containing two arguments ('She is blicking the baby'), but not to intransitive sentences containing one argument ('She is blicking': Yuan and Fisher, 2009). However, it remains unclear whether infants' bootstrapping representations exploit a simple matching relation between the number of arguments and participant roles in the event (Yuan, Fisher, and Snedeker, 2012), or a grammatically structured mapping between syntactic positions and thematic roles (Perkins et al., 2018). To investigate the issue, here we tested toddlers' ability to learn verb meanings by manipulating the syntactic structure, but not the total number of participants to the event.

Following the preferential looking paradigm of Yuan and Fisher (2009), we presented French-learning 30-month-olds with dialogues introducing a novel verb in either ditransitive sentences containing three noun phrases ('John dased the cat to the boy'), or conjoined-object transitive sentences, also containing three noun phrases ('John dased the cat and the boy'). Toddlers were later asked to look for 'daser' while watching two different events, containing three characters each: one depicted a transfer action, while the other one a causative action. Our results show that children looked more to the transfer video in the ditransitive condition than in the conjoined-object transitive condition (*p=.023). As sentence types differed only by a preposition ('to/and'), children's success in our task suggests that they can go beyond the strategy of expecting the number of nouns to match the number of participants to the event, and base their inferences on specific grammatical and thematic relations. This study provides direct evidence that grammatical and thematic content, not just number matching, drives syntactic bootstrapping.

SYMPOSIUM 3

THE ONTOGENY OF SOCIAL INFLUENCES ON MEMORY AND COMMUNICATION IN INFANTS AND YOUNG CHILDREN

Saturday 6 January, 13:15-14:30

Organizers/Chairs:

Dora Kampis, University of Copenhagen

Charlotte Grosse Wiesmann, Max Planck Institute for Human Cognitive Brain Sciences

Speakers:

Dora Kampis, University of Copenhagen

Bartuğ Çelik, Central European University

Marie Luise Speiger, MPI CBS

Humans are often influenced by the perspective of others in what they encode and recall, and in a broad range of behaviors (Kampis & Southgate, 2021). Such altercentric phenomena have been documented in adults (Samson et al, 2010) as well as infants (e.g., Kovács et al, 2010, Manea et al, 2023). Altercentrism has been suggested as a general feat of human social cognition, facilitating social interaction and action prediction (Kovács et al, 2010). Others proposed that early in ontogeny infants start out altercentric and become less so with development (Southgate, 2020). These possibilities may be not mutually exclusive as altercentrism may serve different functions early on, where it helps to select relevant information in the environment, versus later in life, when it may support social interaction and communication.

The plurality of how and why others modulate our cognition call for a closer investigation of the scope and underlying cognitive mechanisms of these phenomena across development. Firstly, it is an open question whether altercentrism indeed changes with age, how it is related to explicit verbal Theory of Mind reasoning in the developing mind, and in adults. Second, to characterize the role of altercentrism, we need to probe it in various scenarios, from remembering objects to communicating about them and interpreting communication. The current symposium brings together recent findings showing altercentric effects in the context of object cognition and of communication, spanning a wide age range and methodologies to address these open questions. The first talk (Kampis) will address the scope of altercentric effects in 14-month-old infants, by presenting EEG data showing

that not only remembering object location, but also semantic/category information in the context of communication can be biased - and potentially completely overridden - by what another person believes. The second talk (Çelik & Kovács) will show that representing others' false beliefs that have been induced by communication modulate 18-months-old infants' spontaneous pointing behavior to an object's location in the same way as visually induced beliefs do. However, infants are able to point to the correct location when prompted explicitly to point out where the object is, raising the possibility that they can hold both representations simultaneously. The third talk (Speiger et al.) will present a continuous-measure task demonstrating that adults only show an altercentric modulation of their search for objects if they previously engaged in an explicit Theory of Mind task, and in preschool children only those exhibit an altercentric modulation who passed an explicit Theory of Mind task, suggesting that in older children and adults altercentric effects may depend on explicitly processing the agent's belief. Together these findings point to a potential trajectory where, in young infants, the other's perspective is highly salient and may override infants' own, whereas later the influence of the other's belief may depend on its relevance in context. Dr. Olivier Mascaro will conclude the symposium and discuss the communicative, interactive, and social scenarios that share altercentric effects but may involve different cognitive mechanisms, and the potential ontogenetic (dis)continuities of other-centered human cognition.

14-month-olds' semantic processing is modulated by the perspective of others

Dora Kampis, Victoria Southgate
University of Copenhagen

Early in ontogeny it has been proposed that encoding the environment via others' perspective may dominate (Southgate,2021), possibly serving a learning function (Kampis et al,2013), gaining recent empirical support (Manea et al,2023). While most studies have probed memory for object location or presence, generic (e.g., category) information is especially relevant to learn via others.

A series of experiments probed whether 14-month-old-infants' semantic processing is subject to an altercentric bias. We hid an object in a box, so its representation had to be maintained, and probed if infants detect if it is labelled incorrectly. Exp.1 established that infants detect when an occluded object is mislabeled, by showing an increased N400 ERP-response, typically sensitive to semantic mismatch (Kutas & Federmeier,2011). Exp.2 included a perspective mismatch, and labeling was always incongruent for the infant, but in

50% congruent for the other. We found a reduced N400 in congruent-for-other trials (t(33)=-2.19, p=.036), indicating an altercentric influence on infants' semantic mismatch detection. Exp.3 found no effect of (in)congruency from infants' perspective when the labelling was always consistent for the other (t(33)=-0.42, p=.967), suggesting that congruency for other may override infants' own semantic processing.

While early the other's perspective may take priority when encoding their environment, this bias was argued to decrease through development, as with emergence of a self-concept infants may become less susceptible to the other's perspective. To probe this, we presented 12-36-months-olds (n=243) with a task where altercentric modulation has been found with infants (Kampis & Kovács,2022). There, infants tended to search longer in a box when another person believed an object to be present, than when she believed it was empty. We predicted this tendency to decrease with age. Preliminary results are in line with this prediction. Together, these results are consistent with an initial altercentric bias, decreasing with age.

Communication vs. visually induced belief attribution in infancy: others' beliefs influence 18-month-olds' pointing behavior

Bartuğ Çelik, Ágnes Melinda Kovács

Central European University

While infants seem to track others' beliefs based on what they see (Baillargeon & Scott., 2017 but see Dörrenberg et al., 2018), research targeting whether infants understand that others' beliefs can be induced via communication is scarce. This is surprising, as significant parts of our beliefs are formed through communication, and even infants show a strong trust in such information that even overrides their first-hand visual experience (Mascaro & Kovacs, 2022). The current study investigates whether infants can track others' beliefs that are induced via communication, and whether they rely on visually and communicatively induced beliefs differently. In Experiment 1 and 2 (N = 34, replication: N = 35), eighteen- month-old infants were presented with a false belief scenario following Knudsen and Liszkowski (2012), but the belief was induced communicatively. First, the experimenter invisibly hid a toy in one of three cups. Afterwards the experimenter informed the participant and the confederate about the location of the toy via verbal communication ("The toy is here") and pointing. Next, the experimenter changed the toy's location from one cup to the other, while the confederate was present (TB condition) or absent (FB condition). Then the confederate came back, and we measured infants' spontaneous pointing. Surprisingly, in both experiments infants pointed to the earlier location of the toy

(i.e., empty location) significantly more in the FB compared to the TB condition, reflecting an unexpected influence of the other's belief. In Experiment 3 (N=23, ongoing) we applied a similar scenario, but the initial belief was induced via visual cues: participants and the confederate saw where the toy was hidden. Interestingly, we found a similar effect as in Experiments 1 and 2, suggesting that others' beliefs that are communicatively or visually induced seem to affect infants' behavior similarly.

Altercentric biases in the Sandbox task depend on the development of explicit belief reasoning

Marie Luise Speiger[1], Katrin Rothmaler[1], Hannes Rakoczy[2], Ulf Liszkowski[3], Charlotte Grosse Wiesmann[1]

[1]MPI CBS; [2]Universität Göttingen; [3]Universität Hamburg

Humans possess a unique ability to understand the thoughts and beliefs of others. This extends to a point where other people's beliefs may influence us even when they hold no relevance to our current tasks. Such interferences, known as altercentric biases, have been suggested to reflect automatic belief processing both in adults and preverbal infants. Here, we asked how altercentric biases develop as children acquire the ability to explicitly reason about others' beliefs in classic false belief tasks, and how they interact with explicitly reasoning about the others' belief. To investigate this, in two pre-registered studies, we asked preschool aged children and adults to search for objects in a continuous search space (a 'sandbox') while another agent had a false belief about the object's location. We predicted that participants' responses would systematically deviate from the actual object location toward the agent's believed location. Indeed, we found evidence for such an altercentric bias in adults' search location (N=113). However, this bias was only present when participants were asked to explicitly reason about where the agent would search for the object in a previous task, and not when this explicit belief reasoning task was conducted after the object search task. Similarly, in preschool children (N=56, data collection ongoing), we only found evidence for an altercentric bias in children who passed a standard explicit false belief task but not in pre-schoolers who failed this task. These findings indicate that altercentric biases from another person's belief may (re-)emerge as children begin to explicitly reason about others' beliefs, and in adults and preschool children, may depend on explicitly reasoning about this person's belief.

Discussant: Olivier Mascaro (Integrative Neuroscience And Cognition Center - Université De Paris & CNRS)

PAPER SESSION 6

EXPLORATION AND CURIOSITY

Saturday, 6 January 2024, 16:30-17:30

Chair:

Balint Varga

Curious collectors: What do children collect?

Martin Zettersten, Casey Lew-Williams

Princeton University

Introduction: Children enjoy collecting. William James noted that the drive to collect emerges early in childhood and often becomes the focus of intense interest and time investment: "if accidentally [a collection] be begun [...], it will probably be continued" (James, 1890). However, there have been few attempts to empirically investigate what children collect, and why. In the current study, we asked what kinds of objects children collect, how collecting changes with age, and what patterns emerge in collecting habits.

Method: Parents (N=211) reported information about what their children (M=6.9 years, range: 2-15) collect in an online survey. Parents were asked whether their child collected anything and, if so, to list their children's favorite collections. They then answered a series of questions about each collection (e.g., how are new items added to the collection?) and their child's general collecting behavior.

Results: Collecting was widespread: 93.8% of parents reported that their child collects something. On average, children had 3 distinct collections (SD = 1.61) and added more collections with age (b=0.09, t(208)=2.15, p = .03). Children's collections were highly variable. Our sample contained 225 distinct collection types – 70% of which were unique. At the same time, there was distinctive structure in collecting preferences: in a hierarchical clustering analysis, we found that collections tend to systematically co-occur (e.g., collections related to plants tend to have similar co-occurrence patterns).

Discussion: Collecting behaviors provide a window into children's active curiosity about their environments. This descriptive work sets the stage for studying how collecting behavior shapes children's early learning. In our presentation, we will also report on the results from ongoing work (a) studying the longitudinal progression of collecting and its relation to individual differences in temperament and curiosity (current N=160) and (b) validating the parent-report results in in-depth, structured interviews with children (current N=54).

Infants and young children's information search

Daniil Serko[1,2], Yi-Lin Li[1,2], Nora Nora Swaboda[1,3], Azzurra Ruggeri[1,2,4]

[1]iSearch; [2]Technical University Munich; [3]Max Planck Institute for Human Development; [4]Central European University Vienna

Experiment 1, investigated whether children (n = 86) aged 25 to 59 months can efficiently search for information. Children had to find a present hidden in one of three closed boxes. Boxes were identical but for one feature (e.g., all boxes were blue and had a flower symbol on top, but one box was round, one heart-shaped, one squared). To identify the target box, children were presented with three information cards, each revealing one feature of the target box (i.e., color, shape, or icon). As the boxes differed in only one feature (e.g., their shape), only one information card contained the information necessary to make the decision (i.e., the information card indicating the shape). Children could flip one information card before deciding which box to open. Our findings indicate that children select the relevant card already from age 2 – a much younger age than what prior work concluded. Experiment 2, investigated at what age children begin differentiating between information's relevance. We tested 11- to 20- month- old infants (n = 50), using an eye-tracking paradigm mirroring the information-search structure of Experiment 1. Infants saw four boxes, one on each corner of a screen, each presenting a different pattern or shape. In the middle of the screen was an information card that, when flipped, revealed the pattern or the shape of the target box. The cue card provided informative or uninformative information, depending on whether the relevant feature distinguishing the target from the other boxes was the shape or the pattern. We hypothesized that pupil dilation and looking time would vary between informative and uninformative trials, demonstrating sensitivity to the relevance of the information presented. We are currently analyzing the data.
This study explores information-search competence development and will provide valuable insights into how young children perceive and use information.

Error-monitoring and adaptive information-seeking in 12-month-old infants

Cécile Gal, Katarina Begus

Centre for Early Childhood Cognition, University of Copenhagen

Infants have been shown to regulate their information uptake by attending to stimuli with optimal levels of predictability (Kidd et al., 2012), attending to events that violate their

expectations (Stahl & Feigenson, 2015), and requesting information from others (Begus & Southgate, 2012). By age of 12 months, infants also show neural responses when making an error (ERN), which seem to guide their subsequent behaviour (post-decision persistence, Goupil & Koudier, 2016). Here, we investigate whether infants not only regulate their attention following an error or an unexpected event, but whether they adapt how and how much information they seek prior to making a decision, based on the difficulty of the task at hand.

In a novel match-to-sample paradigm, using gaze-responsive eye-tracking and concurrent EEG recordings, infants are presented with three cards, two of which have an identical image (e.g., an apple). The image on the third card varies in its similarity, from very different (e.g., a car) to very similar (another apple). Infants are free to sample as much information as they wish before making a decision. We measure: 1) scanning patterns and timings of infants' eye movements to explore whether infants adapt their information search based on the difficulty of the task (similarity of the images); and 2) infants' neural responses to investigate whether infants' information search is guided by their internal monitoring of the accuracy of their decisions (ERN).

100 12-month-old infants will be tested (sample projected to be complete in October 2023). Analyses of pilot eye-tracking data suggest infants adapt their information sampling to the difficulty levels, and that more adaptive information search leads to better performance. This dataset, combining infant-controlled information sampling and concurrent EEG data, can offer novel insights into infants' own regulation of information seeking and learning, and the neural responses used to guide it.

PAPER SESSION 7

PERCEPTION

Saturday, 6 January 2024, 17:45-19:05

Chair:

Maja Blesic

Context-dependent categorization of ambiguous visual stimuli in the infant brain

Laura Bourgaux[1], Diane Rekow[2], Arnaud Leleu[3], Adélaïde de Heering[1]

[1]Université Libre de Bruxelles; [2]University of Hamburg; [3]Université Bourgogne Franche-Comté

Face pareidolia is the illusory perception of a face in ambiguous objects or patterns, as reflected by face-selective electroencephalographic (EEG) activity in both adults and infants. However, the perceptual interpretation of these ambiguous stimuli depends on the context in which they are presented. In particular, we recently found that, in adults, ambiguous face-like stimuli are interpreted as faces in a non-face context and as non-face objects in a face context. Accordingly, here, we aim to explore how visual context shapes the perception of ambiguous stimuli early in life. We measured scalp EEG activity in 4-to-6 months-old infants using a frequency-tagging approach which is particularly suited to test infants because it allows for short and efficient recordings, has an excellent signal-to-noise ratio and is immune to most artifacts. Infants were exposed to 20-second sequences of natural images presented at a rate of 6 images per second (6 Hz), with ambiguous stimuli inserted every 5th image (at 1.2 Hz), and face or house images inserted every 4th image (at 1.5 Hz), defining a visual face or non-face context, respectively. Preliminary data (N=10 infants) reveal that the brain response to ambiguous stimuli is weaker in infants than in adults. Contrary to the adult responses, the infant response is also more face-like in the face context (with a typical temporo-parietal location of the response) and shifts to a more occipital response in the non-face context. While these preliminary results still need to be consolidated, they suggest that the influence of visual context on the categorization of ambiguous stimuli changes throughout development, likely due to the effectiveness of perception at a given developmental stage.

Impact of socioeconomic status on longitudinal changes in visual working memory function in children in rural India

Sobanawartiny Wijeakumar[1], Samuel Forbes[2], Vincent Magnotta[3], Sean Deoni[4], Vinay Singh[5], Madhuri Tiwari[5], Aarti Kumar[5], John Spencer[6]

[1]University of Nottingham; [2]Durham University; [3]University of Iowa; [4]Maternal, Newborn, and Child Health Discovery & Tools, Bill & Melinda Gates Foundation, Seattle WA, USA; [5]Community Empowerment Lab; [6]University of East Anglia

Each year, 250 million children in low- and middle-income countries fail to reach their developmental potential. Yet, the impact of socioeconomic status (SES) in the first 1000 days of life remains unclear. In the current large-scale LMIC study, we inquired how SES impacts developmental changes in visual working memory (VWM) behaviour and brain function from infancy to toddlerhood. Families with 223 6 and 9-month-old infants from Shivgarh, rural Uttar Pradesh, India were followed across 2 years. Children were presented with a preferential looking task. Portable eye-tracking and video recordings were used to extract looking behaviours and functional near-infrared spectroscopy was used to collect brain function while children engaged with the task. Image reconstruction techniques were used to transform channel-based neuroimaging data into the voxel space using segmented head volumes obtained from MRI scans. There was a moderate impact of SES on behavioural performance at the low load in 6-month-olds and high load in 9-month-olds. In both cases, low SES children showed greater improvement from infancy to toddlerhood compared to high SES children. In our brain findings, SES-related effects were observed in bilateral frontal cortices and left parietal cortex. Importantly, activation in the right frontal cortex was linked to behavioural performances; across both ages, greater frontal activation during infancy predicted greater improvement in behavioural performance in toddlerhood only in low SES children. Our findings contribute to the growing literature of the impact of socioeconomic status on developmental changes in neurocognition in LMIC countries.

Modulation of somatosensory processing by visual and auditory moving stimuli in newborns

Giulia Orioli, Damian Cruse, Andrew Bremner

University of Birmingham

As adults, when we experience auditory and visual motion towards our body we can precisely predict if, where and when we will feel a touch on our body. Surprisingly, little is

known about how this ability develops during infancy and childhood. Recently, we showed that a sample of at 4-month-old infants' somatosensory evoked potentials (SEPs) were modulated according to whether the somatosensory stimulus was preceded by approaching vs receding visual motion. Such an early appearance of this differentiated response raised the question of whether this crossmodal sensory capacity is established even earlier in development. We have started to investigate this by exploring newborns' (9- to 40-days-old) electrical brain responses to touches preceded by approaching vs receding visual or auditory motion. Data collection is currently in progress (expected sample size for each of the 2 studies, N = 20). Thus far we find evidence of a modulation of the SEP by the preceding direction (towards or away from the hody) of both auditory (n = 16) and visual motion (n = 10). There appears to be an enhanced somatosensory response to a touch when preceded by a sound increasing vs decreasing in amplitude (300-500 ms post stimulus onset) and by a visual stimulus increasing vs decreasing in size (400-500 ms post stimulus onset). We also observe that the age in days of the participants may influence their SEP responses in the visual, but not the auditory, study. Evidence of a differentiated response to touches following approaching vs receding stimuli would indicate that from very early in postnatal development humans are sensitive to the relationship between auditory and/or visual stimuli in the extrapersonal space and tactile stimuli on the body.

The acceleration of perception in infancy help making sense of the world by enhancing visual categorization efficiency

Céline Spriet, Emilie Serraille, Liuba Papeo, Jean-Rémy Hochmann

CNRS, Institut des Sciences Cognitives Marc Jeannerod

Cortical myelination and brain maturation predict an acceleration of visual processing in the first months and years of life. We show that, as visual processing gets faster with age, this also impacts the integration of information and interpretation of the visual input. In the present work, we operationalize participants' understanding of the visual input by their capacity to categorize images as exemplars of the large animate or inanimate categories. Using electroencephalography (EEG) and the frequency-tagging paradigm, we measured an automatic categorical response of animate and inanimate stimuli in adults and 4- and 9-month-old infants. Images taken from a large pool of stimuli of one category (e.g. 320 different images of inanimate objects) were presented regularly at Fb (e.g., 6 Hz), while varying images of the target category (e.g., 68 different images of non-human animals) were intermixed at Ft=Fb/5 (e.g., 1.2 Hz). Four-month-olds (n = 64) were tested with Fb = 4 or 6

Hz; 9-month-olds (n = 64) with Fb = 6 or 12 Hz, and adults (n = 36) with Fb = 6, 12 or 30 Hz. Results revealed an automatic and fast categorical response by animacy that is stronger at slower frequencies and in older participants. Indeed, the neural signature of categorization – a spectral response at the target frequency – could be captured in the EEG signal only at 4 Hz in 4-month-olds, but also at 12 Hz in 9-month-olds and at 30 Hz in adults.

These results suggest a dramatic acceleration of visual categorization in the first year of life and until adulthood. Nine-month-olds understand the world at least 3 times faster than 4-month-olds but are still slower than adults. The slow neural processes integrating visual information in very young infants yield slow understanding of the visual world, possibly filtering out unstable or overstimulating information.

BC3D

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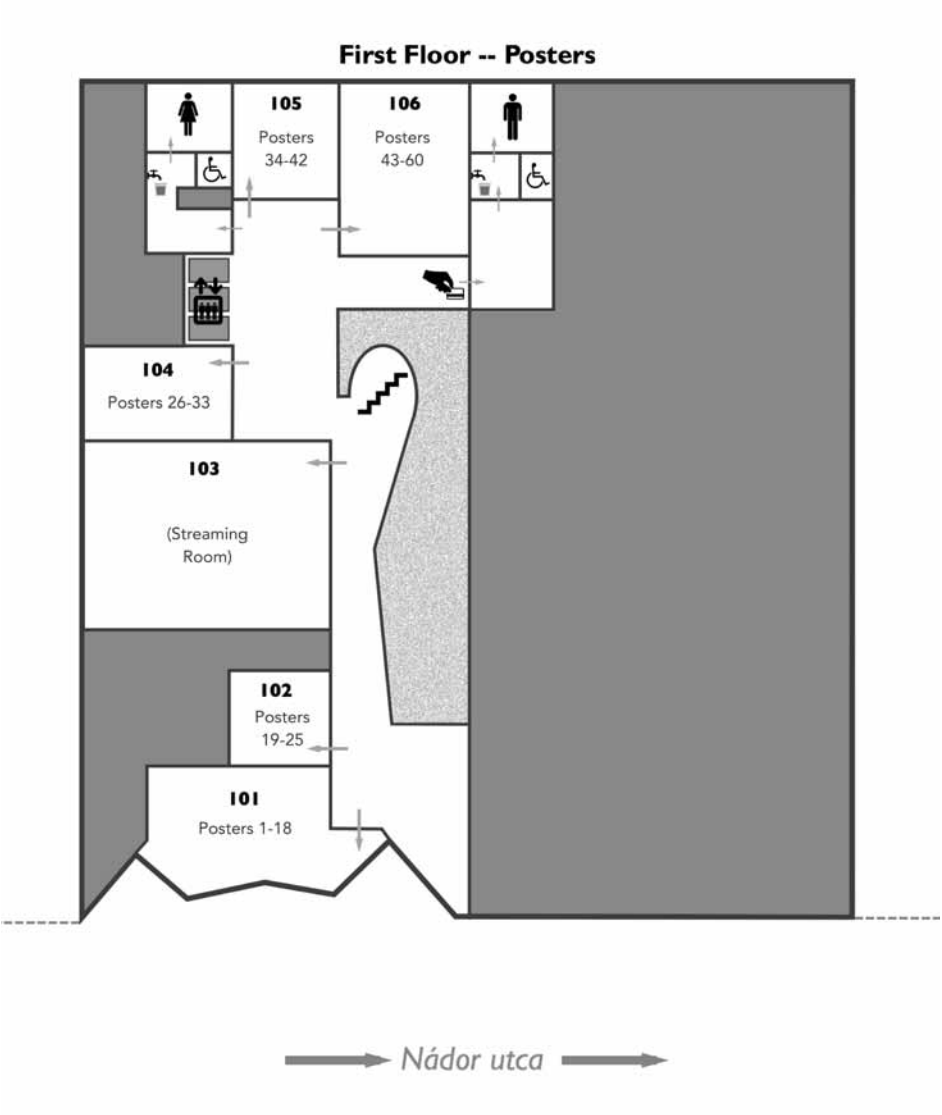
POSTER SESSION A: THURSDAY



POSTER SESSION A
THURSDAY

PA-01 Do infants have an early-emerging concept of plants as categorically different from animate agents or inanimate objects?

Esra Küçük, Melissa Kibbe
Boston University

What are the ontological origins of our concepts of what is alive? Animals and plants both are living things, but plants, unlike other living things such as humans and animals, do not exhibit observable movement. While preschoolers primarily categorize only moving entities as alive, excluding plants (Piaget, 1929; Young & Shtulman, 2020; Zaitchik et al., 2014), infants are more hesitant to explore plants than non-living objects (Wertz & Wynn, 2014a; 2014b), potentially suggesting that plants are differentiated from at least inanimate objects in infancy. We aimed to investigate whether infants represent plants as belonging to a kind distinct from human agents or inanimate objects. We used an individuation procedure adapted from Bonatti et al. (2002) to examine infants' categorical distinctions. In Experiment 1, 10-12-month-old infants (N=25) were shown videos in which two objects (a plant and a human-like doll head) appeared alternately from behind an occluder. Post occlusion, we revealed either one object (unexpected outcome) or both objects (expected outcome), and measured infants' looking times to each outcome. We found that infants' looking times to each outcome did not differ significantly ($F(1,24)=3.73$, $p=.65$), suggesting that infants may represent plants and human faces as belonging to the same or similar kinds (e.g., "living thing"). In ongoing Experiment 2, infants observed the same objects as in Experiment 1, except that the doll head was inverted (which infants process as an inanimate object; Bonatti et al., 2002; Kibbe & Leslie, 2019). While data collection is ongoing, we predict that if infants represent plants as belonging to the kind "living thing", they should individuate the objects in Experiment 2. We will discuss the implications of these results for our understanding of infants' early conception of what is alive.

PA-02 Exploring ostracism influence on behavioral reactivity and over-imitation in preschool-aged children

Alessia Testa, Giada Basset, Chiara Turati, Hermann Sergio Bulf, Ermanno Quadrelli
University of Milano-Bicocca

Ostracism, the experience of being kept apart from others physically or emotionally, has significant effects on cognitive, affective, and behavioral processes throughout the lifespan. Available literature demonstrates that ostracism increases children's imitative behaviors, possibly reflecting their underlying need for re-affiliation. Yet only few studies investigated how ostracism modulates the processing of social information early in life. Forty-three 3-year-olds and forty-three 5-year-olds participated in a face-to-face triadic ball-tossing game (Quadrelli et al., 2023) where they were either included or ostracized. Children's behavioral reactions during the experimental manipulation were video-recorded and off-line coded using a set of predefined clusters - i.e., Positive Emotionality (PE), Negative Emotionality (NE), Activity Level (AL), Visual Attention (VA). Next, they participated in an

over-imitation task, observing a model perform relevant and irrelevant actions in two possible action sequences (Horner & Whiten, 2005). Children's behaviors were scored to obtain an index of their efficiency. Behavioral reactivity results highlighted that ostracized participants showed decreased levels of PE ($p<.001$) and increased levels of NE ($p<.001$) during the experimental phase, compared to their baseline; ostracized participants showed lower levels of PE ($p<.001$) and higher levels of NE ($p<.001$) compared to included participants. Furthermore, ostracized participants displayed an increase in their AL during the experimental phase ($p<.001$), and both groups reported a decrease in VA during the experimental phase ($p=.001$). Over-imitation results indicated that ostracism influenced children's imitative responses, with 3-year-olds over-imitating more when excluded ($p= .013$), and 5-year-olds over-imitating more when included ($p= .026$); also, included 5-year-olds over-imitated more compared to included 3-year-olds ($p=.011$), and excluded 3-year-olds over-imitated more compared to excluded 5-year-olds ($p=.030$). Overall, current data indicates that ostracism affects preschoolers' behavioral reactivity and imitative behaviors, emphasizing the importance of investigating social mechanisms underlying imitation and young children's social cognition development.

PA-03 Improving children's compositional reasoning in math and reading using home-based games

Akshita Srinivasan[1], Samuel Gregory[1,2], Lucia Vilches[1,3], Elizabeth Spelke[1]
[1]Harvard University; [2]University of Bath; [3]New York University

In primary school, children need to master the compositional concepts underlying mathematics and reading: how numbers ("two and "ten") combine to form larger numbers ("twenty") and how speech sounds ("b" and "at") combine to form words ("bat"). These concepts are hard for children to learn, because the rules for composing them are rarely transparent in the language and symbols that express them. For numerical concepts, English number words such as "eleven" and "twenty" do not convey that they designate sets composed of "ten and one" and "two tens," and the symbols "11" and "20" do not convey the two digits in these numbers compose by addition (10+1) and by multiplication (2x10). To address these problems, we evaluated the impact of two home-based games that aimed to improve 6- to 7-year-old U.S. children's (n=64) understanding of the compositional concepts underlying the base-10 number system and reading skills. The number game used arrays of dots grouped by tens and a 10 x 10 spatial board whose rows and columns combined numbers by addition and multiplication, respectively. The reading game used a similar board whose rows and columns organized real and nonsense words by alliteration and rhyming, respectively. Using a randomized design, where half the children played the number game and the other half played the reading game for 2-3 weeks at home with their caregivers, we found that children who played the number game significantly improved in their school-relevant numerical skills, relative to those who played the reading game; improvements in reading skills did not differ across the two conditions. At least for numerical concepts, our findings show that making educational games training compositional concepts available to children in their homes has the potential to foster skills at the foundations of learning in school.

PA-04 What Does Spatial Exploration Have to Do with Children's Well-Being?

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Childhood exploration has positive benefits for cognitive development; however, stricter parenting styles due to cultural trends toward over-parenting have restricted children's mobility and independent exploration in the past 40 years in many contexts (Brucato, 2022). What are the implications of restricted mobility and independent exploration on child development? One way to approach this question is to investigate cultures with fewer restrictions on childhood mobility. As a small population with few strangers, the Faroe Islands, an autonomous territory of Denmark, is an ideal location for testing children's exploratory behavior (Schug, 2016). Furthermore, Faroese adults have more mobility and spatial ability compared to other populations (Schug, 2022). The larger range of spatial ability and mobility in the Faroese population, as well as the high interpersonal trust within the culture, affords an opportunity to explore factors related to exploration during development. Through child and parent reported surveys and child spatial assessments, 13 Faroese youth (M=12.08 years, SD=0.86, 3 males) were assessed on wayfinding experience, well-being, executive function, and spatial cognition. One purpose of this pilot study was to establish the validity of the measures in the Faroese language and culture. Results indicate high reliability among child and parent reported measures, high validity among each measures' subscales, and a correlation between two spatial assessments (Perspective-Taking and Mental Rotation, $r=.64$, $p<.05$). Addressing the central research question, we found a significant negative correlation between overparenting and children's wayfinding experience ($r=-0.58$, $p<.05$) and a negative correlation between overparenting and child life satisfaction ($r=-0.64$, $p<.05$). These preliminary findings provide initial support for the hypothesis that overparenting can inhibit children's exploration with negative consequences for key developmental outcomes like well-being. Ongoing analyses are investigating participants' patterns of spatial exploration (e.g., range size) over a one-week period, using GPS tracks and experience sampling methodology, to identify correlates of spatial exploration.

PA-05 Multimedia elements and marked interactions enhance learning in primary school children

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The use of applications with embedded multimedia elements (e.g., animations) and interactions (activities related to the topic utilizing the touchscreen) are promising to promote learning in children. If not used properly, however, they can be cognitively demanding for primary school students, especially those with less mature executive functions. Interactions might serve as a distraction, especially when children are looking for them on the screen instead of paying attention to the learning material, hence increasing

cognitive load. Signaling interactive functions might reduce distraction and load, and, consequently, improve the quality of memory encoding even in at-risk samples. To test this, we investigated the learning outcome of primary school children (N=46; M=9.36 years) after a storybook exposure. Children were randomly assigned into four groups. In the marked interactive group, children saw a story using an interactive application where interactions were marked with a small icon. The non-marked interactive group was identical with the exception that interactions were not marked. In the multimedia group, children watched a video of the application with narration. Lastly, the control group saw static illustrations with narration. We measured recall performance right after the exposure by answering questions related to the story. We also assessed children's working memory capacity and executive attention. We found that both marked and non-marked interactions and multimedia elements facilitated learning compared to the control group. More importantly, while multimedia elements and marked interactions improved recall performance regardless of attentional performance, learning with non-marked interactions resulted in worse memory encoding the lower a child scored on the attention tests. Working memory capacity showed no impact on learning performance. Overall, multimedia elements and marked interactions could guide attention and support efficient information processing. This is especially pronounced for those with less mature attentional mechanisms.

PA-06 Cultural Markers: The Role of Gesture in Identifying In- and Out-Group Members

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Across cultures and time, people have spontaneously categorised those around them into in-group - and out-group members. For instance, speech can instantly disclose others' cultural and geographical origins. However, when someone speaks, they also gesture. Despite its ubiquity in human communication and its variation across cultures (Cavicchio & Kita, 2013; Kita & Özyürek, 2003), the role of gesture in social categorisation remains largely unknown. Here we evaluated if adults can accurately judge group membership (in-group vs. out-group) based on gestures. Experiment 1 used a forced-choice task in which American adults (N = 66) watched muted videos of individuals speaking and gesturing, then judged if they were American (i.e. in-groups) or Not American (i.e. out-groups). Videos were 10 second long slices of TED talks of American and French Caucasian females (see Figure 1). They were muted and speakers' faces were blurred to prevent lip-reading or speaker recognition. Experiment 2 (N = 62) replicated Experiment 1 for a different cultural combination: American English and Spanish.

Participants' sensitivity (A') to group membership was significantly above the 0.5 chance level (MA' = 0.6519, $p < .0001$; Figure 2). This suggests that gestures can reliably reveal group membership in the absence of other communicative cues such as language or facial emotional expression. Experiment 2 replicated these findings using Spanish instead of French videos. Again, participants' sensitivity

was significantly above chance (MA' = 0.6421, $p < .0001$; Figure 2). We found that judgements were more accurate for videos with more diverse movement, suggesting that richer gestural behaviors are more likely to disclose one's cultural background. Overall, we show that gestures function as a social group marker. Even when deprived of the rich, multimodal cues found in real-life, gesture-based social categorization is surprisingly accurate.

PA-07 Capuchin monkeys in virtual environments

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Computerised technology is an increasingly popular tool for cognitive testing with non-human animals. Technology in cognitive research has numerous benefits, such as tighter control over stimuli presentation and recording responses, as well as for public engagement and science communication. Recently, virtual environment (VE) software has been successfully implemented in cognition research with non-human primates. In VEs, novel stimuli can be presented in innovative ways, opening the door to studying aspects of cognition in new task contexts, and studying phenomena in ways which may not be possible when restricted only to real-world space. We present evidence from capuchin monkeys (Sapajus apella) in a computerised virtual foraging task presented on a touchscreen. Capuchins learnt to move an avatar, viewed from a first-person perspective, around a virtual arena to collect virtual fruit. The capuchins engaged in progressively more challenging stages of the task and were able to turn their avatar to collect out of sight fruit, avoid obstacles, and move their avatar across increasing distances to collect fruit further away. Overall, capuchins were successful in learning the skills required for VE tasks. Future work within this virtual world will investigate capuchin's performance in a virtual short-term memory task and assess the equivalence of their performance in a VE to that in real-world, physical memory tasks. We show here that VE touchscreen tasks are a feasible method for studying cognition with capuchin monkeys, offering the possibility to study primate cognition in novel and engaging ways without the physical constraints that are often present when designing apparatuses.

PA-08 Emotion-specific vocabulary and its relation to emotion knowlege in children and youth

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Positive associations between general language skills and emotion understanding are well documented in young children. Concurrently, previous research and research from other domains highlights the importance of domain-specific language skills for conceptual development. There is little research on the development of emotion-specific language skills in older children and youth, as

well as the associations of those skills with concept development resulting in emotion understanding. The current study examined emotion-specific language skills with a novel inventory (CEVVT) and the relative contributions of emotion-specific and general vocabulary to individual differences in multiple components of emotion understanding (e.g., knowledge of emotion regulation strategies) in 10-11-year-old children (N=30) and 16-17-year-old youth (N = 30). Emotion-specific vocabulary was measured by size (i.e., number of emotion words used) and depth (i.e., adult-like use of emotion words). Findings emphasize that the role of emotion-specific vocabulary rather than general vocabulary for emotion understanding is increasing with age. Interestingly, the depth of emotion-specific vocabulary explains emotion understanding to a higher degree than the vocabulary size.
These findings complement previous research on this question with younger children and solidifies our understanding of the intricate relationship between language and emotion in the course of a prolonged development of these skills.

PA-09 The Development of Integrative Perception from Infancy to Adulthood

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When we grow from being infants to children to adults, our cognitive abilities become reliant more on previous experience and less on current processing. Namely, we integrate more information from memory in every cognitive task that we perform. This wider integration spans contexts, space, time, and other dimensions. However, it is unknown how this developmental trajectory is manifested in perception. In this line of studies, we investigate how the perceptual integration across time develops from infancy through adulthood using an identical task across age groups, which captures how statistics of prior experience shapes visual perception, and cortical adaptation as a marker for the impact of memory on perception.
We exposed participants to pairs of colorful stimuli and measured their ability to discriminate relative saturation levels. Results showed that adult participants were biased by previously-experienced exemplars, but exhibited weakened in-the-moment discrimination between different levels of saturation. In contrast, infants and children showed less influence of statistical learning in their perception, and they actually outperformed adults in discriminating between current levels of saturation. Cortical adaptation has been characterized in various neuroimaging studies as a carrier of memory; and, while previous research has explored cortical adaptation in specific age groups, less is known about how it changes across development and the nature of the relationship between cortical and cognitive development is poorly understood. Using fNIRS we investigate how the temporal, occipital, and frontal cortices in the infant, child, and adult brain respond to repetition of audio-visual stimuli in varying inter-stimulus-intervals. We found shorter adaptation timescales (faster recovery) in infancy and early childhood and longer timescales later towards adolescence and adulthood. Taken together, our behavioral and neural findings suggest that as humans develop, their perception relies more on statistics of prior experience and less on current observation.

PA-10 Children's exploration is driven by rewards, but sustained by uncertainty

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Previous work has shown that information gain can act as an internal reward, strong enough to drive young children's exploratory actions in the absence of rewards. Ruggeri et al. (2023) presented preschoolers with a simple game in which they had to search for an object (which they never found) hidden behind a series of doors, and manipulated the degree of uncertainty about the identity of the object (i.e., it could be one of two or one of 8 different animals). When uncertainty was higher and, therefore, more information could be gained with each action (i.e., opening a door), children persisted longer (i.e., opened more doors and played the game for a longer time). While this study demonstrated that information gain is a robust driver of search persistence, it is unclear how its influence compares to that of extrinsic rewards and, further, whether it is consequential enough to affect children's decisions about which activities they want to engage in. In the current experiment, children played a mystery-solving game in which they were presented with a forced choice between two tasks. Critically, in a crossed design, these tasks differed in their degree of uncertainty (low or high, just like in Ruggeri et al., 2023) and promised reward (one or three stickers). Preliminary results (n=97, age range 5 to 15 years,out of the pre-registered sample of 125) reveal a strong effect of reward magnitude (BF10 = 6.12) but no impact of information gain (BF10 = -.26) on task choice. On the other hand, information gain modulated search persistence in the predicted direction (BF10 = .33), whereas the reward magnitude did not (BF10 = -.58). The dissociation between rewards as a decision factor and uncertainty as a modulator of persistence suggests a complex interplay between extrinsic and intrinsic motivators of exploratory behaviours.

PA-11 Rhythmic discrimination of languages in infants with hearing loss

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At birth, newborns show sensitivity to the rhythm of their native language, i.e. the language they heard prenatally, being able to discriminate it from a rhythmically different language (Peña et al., 2003, May et al., 2018). A current hypothesis (Gervain, 2018; Nallet & Gervain, 2021) suggests that prosody provides the basis of early speech perception and helps infants discover other linguistic units after birth, when the full-spectrum speech signal is available. Prenatal experience is thus hypothesized to be foundational for language learning. But what happens when the prenatal experience is disrupted? To investigate this, we are testing the ability of 0-10-month-old infants with hearing loss (HL) to discriminate their native language (Italian) from a rhythmically different unfamiliar language (English). Sentences in both languages are presented forward and backward. Backward speech, with perturbed temporal features, is a standardly used non-linguistic control (Peña et al., 2003). A control group of age-matched normal hearing (NH) infants is also tested. Infant's brain responses are recorded

using functional near-infrared spectroscopy (fNIRS) recorded in twenty channels covering the frontal, temporal and parietal regions, bilaterally.
Data collection is ongoing (n=20 HL, n=20 NH). Once the final sample is reached, statistical analyses will be performed to investigate whether the brain activation in response to the native language and to the unfamiliar one differs in the HL group, as well as in the control group. Comparison will be performed between the two groups. Preliminary results suggest that both groups show positive, canonical hemodynamic responses to Italian, but inverted responses to English. Group comparisons and condition comparisons (forward vs backward) are ongoing. If found, a deficit in prosodic perception in HL infants could provide theoretical insights into the role of prenatal and early postnatal experience in language development, as well as important applications for screening and intervention in this population.

PA-12 Investigation of effect of story theme on children's learning of pro-social behaviors from storybooks

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When you enter a child's room, it is highly probable that you can see so many storybooks. Storybooks can be used to improve children's social and cognitive skills in addition to their entertaining feature. However, there is limited research on whether and what kind of information children can learn from storybooks and what kind of storybooks promote this learning process. In this study, we aimed to assess the effect of story theme on children's prosocial behaviors such as sharing, helping and honesty by replicating and extending the study by Larsen et al. (2018). Seventy-eight? 6-year-old children (M age = 76 months, SD = 3.28 months, age range = 72 to 84.6 months) were firstly administered pretest behavioral tasks (i.e., assessing sharing, helping and honesty) and after one week period they listened to either realistic, anthropomorphic, or fantastical storybooks about aforementioned prosocial behaviors. After listening to the storybooks, post tests were administered. It was found that children who listened to realistic storybooks showed an increase in their sharing behavior from pre-test to post-test compared to children in either anthropomorphic or fantastical conditions. We did not find this kind of effect of story theme for helping or honesty tasks. However, children's scores on these tasks increased from pre- to post-tests which suggested that listening to storybooks about the positive impacts of these behaviors itself promoted children's prosocial behaviors. All these findings will be discussed in the light of literature.

PA-13 How similar is children's and their parent's future-oriented cognition?

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Future-oriented cognition (FOC) involves several skills that are critical to daily functioning: planning, prospective memory, episodic foresight, saving, and delay of gratification. So far, research has shown that FOC emerges during early childhood and develops throughout childhood. Children's cognitive (e.g., executive function) and language abilities contribute to the early development of FOC (Hudson, 2011), but little is known about the contribution of parent's FOC and socioeconomic status (SES) to children's FOC. The current study aimed to (a) investigate the links between children's and parents' FOC and (b) examine the role of SES in parents' and children's FOC. In Study 1, 146 parents of 3- to 5-year-olds completed the Children's Future Thinking Questionnaire (CFTQ; Mazachowsky & Mahy, 2020) and the Parent's Future Thinking Questionnaire (PFTQ) to measure their own and their child's FOC (i.e., planning, prospective memory, episodic foresight, saving, and delay of gratification). Parents also completed several measures assessing their child's executive function, delay aversion/discounting, future-orientation, and family demographics. Parent's saving, prospective memory, and episodic foresight (but not planning and delay of gratification) predicted corresponding subscales on the CFTQ after controlling for executive function, delay aversion/discounting, and future-orientation (βs=0.17-0.20, ps<.02). SES was not an independent predictor of children's FOC. Study 2 focused on prospective memory (PM) in particular: parents of 2- to 6-year-olds (N=179) completed the PM subscale of CFTQ, the Prospective and Retrospective Memory Questionnaire (to measure parents' PM; Smith et al., 2000), and other measures of their and their child's executive function and demographics. Child's age and their executive function (βs=0.25-0.28, ps<.001), but not parents' executive function, PM, and SES, were independent predictors of children's PM. Parent's saving and episodic foresight might influence their child's abilities in these domains, however, children's developing PM, delay of gratification, and planning might heavily rely on cognitive abilities (e.g., executive function).

PA-14 A Deeper Look into the Mind: The Relationship between Parental Reflective Functioning and the Duration of Joint Attention between Infants and Mothers

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Kadir Has University

Attention sharing between infants and caregivers (i.e., joint attention) is crucial for the development of language (e.g., Tomasello & Farrar, 1986). Therefore, investigating the factors related to joint attention is important. Parental reflective functioning (PRF; i.e., understanding and differentiating parents' own and their infants' mental states), may be potentially significant in sustaining joint attention by parents' better understanding their infants' attentional focus. This study examines the relationship between PRF and mother-infant joint attention.

A total of 69 infants (27 girls; age range: 9-16 months, M(SD)=12.2(1.4)) and their mothers participated in the study. Joint attention was assessed by a 10-minute free-play session with 7 age-appropriate toys. An episode of shared attentional focus between the mother and the infant was coded as joint attention if they focused on an object for at least 3 seconds (Tomasello & Todd, 1983). The number of and the total and average durations of joint attention episodes were coded. PRF was measured with the Parental Reflective Functioning Questionnaire having three subscales, namely, interest and curiosity in mental states (e.g., "I am curious to find out how my child feels."), certainty about mental states (e.g., "I always know what my child wants."), prementalization (e.g., "My child cries around strangers to embarrass me.") (Luyten et al., 2017). Results revealed that parents with greater interest in their infants' mental states had longer (on average) (rs=.24, p=.04) and fewer joint attention episodes (rs=-.35, p=.003). Conversely, higher prementalization scores predicted shorter (rs=-.25, p=.04) and more frequent episodes (rs=.27, p=.02). Certainty about mental states was not related to joint attention. Overall, these findings suggest that parents who are curious about their infants' mental world have longer but fewer joint attention episodes, indicating deeper engagement. In contrast, higher prementalization scores might reflect challenges in sustaining joint attention, implying possible misinterpretations of the infant's intent.

PA-15 Learning in a curiosity-driven context: the effect of young children's selective interests across language development

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Parents often report their children being intensively interested in certain objects from their environment, and as primary caregivers, play a vital role in nurturing these interests; from which children also learn better (Chi & Koeske, 1983; DeLoache et al., 2007; Mani & Ackermann, 2018). While such interests develop young as 18 months, it is unknown how these interests are sustained across early childhood, and their influence on language development and daily interactions. Against this background, we present two studies that (a) takes a longitudinal look at the development of children's interests in particular object categories, and subsequent effect on their vocabulary, and (b) examines whether children's interests modulate the quality of parent-child interactions and subsequent novel word retention. (a) The first study measured parent reports of children's category-specific vocabulary knowledge and interests at two timepoints in development – 18 and 24 months. We found here that parents report that children's category-specific interests are sustained over a 6-month period, and that these interests at 18 months predict the size of the category-specific vocabulary at 24 months. (b) In the second study, parent-child dyads (children 24-30-months-old) participated in a shared book-reading task, where the dyads read two books; one of high and one low interest to the child, with one novel word-object mapping in each book. Here, the quality of interaction varied as a function of children's interest in the books; however, we found no effect of interest or interaction quality on novel word learning, though children successfully learnt the novel word. Taken together, we show

that children's sustained individual interests during their formative years influence the trajectory of their category-specific vocabulary size, and at a later stage, their selective interests also influence the quality of interaction during shared book-reading, although its direct influence on word learning is no longer apparent.

PA-16 Contextual and Individual Differences in Imitative Fidelity Between the Ages of 6 to 8

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Preschool-aged children associate causally opaque actions (COAs) with affiliative motives and exhibit high levels of imitative fidelity (IF) in social conventions (Legare et al., 2015). The current study examined the role of language cues, age, theory of mind, working memory, and religious exposure on childrens' IF. Children were (N = 89; 58.4% Female) 5.67- to 8.83-years-old (M = 7.327, SD = .850) and belonged to one of the following religious affiliations: Muslim (n = 31.5%), Protestant (n = 29.2%), Catholic (n =21.3%), non-Religious (n = 14.6%), or Other (n = 3.3%). Participants engaged in a necklace task embedded with COAs and were randomly assigned into a verbal condition. Children in the conventional condition were told that the task was performed by everyone the same way, and children in the instrumental condition were solely explained the objective of the task before they were prompted to make their own necklace. Children's IF score was the average of five target actions they reproduced. Results indicated that children's IF was higher in the conventional (M = 0.58, SD = 0.28) than the instrumental (M = 0.43, SD = 0.31) condition, t(87) = -2.44, p = 0.017, 95% CI [-0.27, -0.03]. Theory of mind, age, and working memory did not relate to IF scores. Religious exposure was negatively related to IF scores, r(87) = -.28, p = .008. A linear model testing the effect of religious exposure on IF after controlling for condition and task order effect was overall significant, $R^2 = 0.25$, R^2 (adjusted) = .226, F(3, 85) = 9.55, p < .001. Findings suggest that children in this age group copy actions more closely when the context hints social conventionality. However, children with higher religious exposure may be more selective about who to learn social conventions from.

PA-17 The development of irony comprehension: Examining the role of epistemic vigilance

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Irony involves implicitly communicating a dissociative attitude towards some ludicrously false or irrelevant proposition attributed to another source (Wilson & Sperber, 2012). This suggests that to fully capture its acquisition pattern it is necessary to determine which mechanisms underlie the recognition of the speaker's attitude. Recent pragmatic accounts suggest that epistemic

vigilance, or the capacity to assess the reliability of the source of incoming information and the believability of its content, may be crucial for differentiating irony from mistakes or lies, as well as for grasping the speaker's ironical attitude (e.g., Mazzarella & Pouscoulous, 2021; Wilson, 2009). The present study investigated the development of irony comprehension and its interplay with epistemic vigilance. We tested irony understanding in 4- to 8-year-old children (N=186) in an offline picture selection task. Participants were presented with short pre-recorded stories accompanied by pictures, each involving an interaction between a mother and a child. In preliminary 'epistemic vigilance stories', we explicitly manipulated the reliability of the child (Reliable and Unreliable), and we measured participants' epistemic vigilance before and after receiving feedback on the child's accuracy (Vigilance measure). Participants were then exposed to a series of stories in which the child was expected to perform some action requested by the mother, and depending on the outcome the mother would either react with a literal or an ironic remark. At the end of each story, they were asked to point to the emoticon that depicted the feelings of the mother (based on Köder & Falkum, 2021). Our preliminary analyses show that irony understanding emerges around the age of 5-6 but appears to be rather fragile during middle childhood. Importantly, epistemic vigilance facilitated irony recognition: for vigilant children, irony understanding was higher in the Unreliable condition than in the Reliable condition.

PA-18 "Generalize or not to generalize?" - Exploring children's inferences about information encountered in game episodes

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It has been demonstrated that 3-year-old children refrain from generalizing knowledge about object identities stipulated in pretend play to ignorant others. In this study, we aim to explore whether children differentiate between novel properties of an object that are introduced as pretend and those that are introduced as actual properties. We plan to uncover if they would infer that the actual property they have just learnt themselves could be shared by those who were not part of the game, while the pretend properties are not.

During the experiments, children play together with an experimenter and well-known objects. Two play episodes are connected to each object: the first corresponds to the canonical function of the object with a given prop (for example, a pencil and a pencil sharpener), while the second involves novel information about the object with another prop (for example, that the end of the pencil has magnetic properties). The experimental manipulation is whether these games are introduced as "real" or "pretend". These happen in the absence of a second experimenter. Following these episodes, this second experimenter decides to play with the object, and asks for a "missing" prop. We measure how children interpret this request by recording their object choices. Our prediction is that in case the property is introduced as an actual property, more children would select the prop corresponding to this novel property. In the other pretend condition, we predict the pattern to be the opposite. The data collection is ongoing (n = 18, aimed sample size = 60), but the current data partly

supports this prediction: in the pretend condition, more children select the prop corresponding to the canonical function of the object (72% vs 28%). The pattern differs in the real condition: children select the two props at similar proportions (44% vs 56%).

PA-19 How attention guidance shapes infants' visual cortical processing of objects vs background

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In the first year of life, infants show a significant development in their ability to selectively attend to objects in the environment, with crucial consequences for early cognitive functioning and learning (Reynolds, 2015). Social interactions influence infants' attention: When looking at novel objects, infants' neural responses increase following joint attention and eye contact with an adult (Hoehl et al., 2014). However, it is not yet established whether early social interactions can shape infants' visual processing toward the object versus background of a visual scene (Bornstein et al., 2011). Here we conducted an experimental study to test if differential attention guidance can shape infants' visual cortical processing of object versus background of a visual scene. Visual processing of object versus background could be assessed in children's electroencephalogram by using frequency tagging (Köster et al., 2017). This is, presenting object and background at different driving frequencies elicits separate evoked responses for each element. In the current electroencephalography (EEG) study, 11-12-month-old infants (n = 53) watched natural images with an object in front of a background, flickered at different driving frequencies (5.67 and 8.5 Hz, counterbalanced) while infants' visual cortical processing was recorded with EEG. We applied a between-group, pre-post design with an experimental manipulation (training phase). During training, an experimenter guided infants' attention by consistently pointing either to the object or the background on the scene (according to group). Our preliminary results showed that infants' neural responses increased at the stimulation frequencies at occipital electrode sites, supporting the utility of frequency tagging as a tool to assess infants' visual cortical processing during social interactions. We will present further results on how differential attention guidance shapes infants' visual attention to objects vs background. Our study will help to uncover the role of early interactions in the development of attention allocation and scene perception.

PA-20 Understanding the value of a goal coincides with helping behaviour in 1-to-2-year-olds

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Classic belief-desire psychology (Wellman & Woolley, 1990) is still the most prominent model for psychological understanding of human actions. We claim, however, that this theory falls short of

most everyday cases of action understanding. Instead, intentional actions are much more likely to be understood based on objective facts and goals: A person carrying books tries to open a cabinet. Why? To put the books inside. The books being in the cabinet is thus a desirable goal state (value fact), and opening the cabinet is necessary to bring about that goal (instrumental fact). This teleology theory (Perner & Esken, 2015; Perner & Roessler, 2010; Roessler & Perner, 2013) hence provides a good explanation for cooperation and helping behaviour in humans (which emerges at around 18 months; Warneken & Tomasello, 2006): As the goal is something objectively desirable, everyone has a reason to (help) bring about that goal. We wanted to test the assumption that children who understand that the goal of an intentional action is something of value are more likely to help others achieve their goals. We showed N = 36 children between 12 and 25 months (M = 19.43, SD = 3.92) an animated agent intentionally going to box A but not box B. We tested whether children understand the value of the agent's goal by asking "In which box are the biscuits?". After that, children participated in four helping tasks. We found that children who helped in two or more of the tasks also expected the biscuits more often to be in the box the agent chose compared to children who helped only once or not at all ($\chi^2(1) = 4.915$, $p = .027$, Cramer's $V = .369$). This is in line with teleology theory which assumes that understanding the value of a goal leads to helping behaviour.

PA-21 Pre-schoolers' mental state reasoning and their ability to derive ad-hoc implicatures

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At the age of 4 years, children succeed in ad-hoc scalar implicature tasks, where the alternatives are contextually available . It is unclear, however, whether they do this by reasoning about the speaker's knowledge or by exploiting to other inferential mechanisms that do not require Theory of Mind. This research aims to investigate this issue by testing children's ability to derive ad-hoc implicatures in a task that also required the attribution of a false belief to the speaker. The experiment consisted of a game in which participants needed to find a little star hidden under one of two boxes. Directions were given by a lion puppet based on what was inside the boxes, and the puppet could be correctly (True-Belief) or mistakenly (False-Belief) informed about the contents of each box. Participants were 84 Italian-speaking, typically developing children and 28 Italian-speaking adults. Children were divided in were three age groups: 4-year-olds (range: 3;11 to 4;11, M = 4;6, SD = 0;4); 5-year-olds (range: 5;0 to 5;11, M = 5;6, SD = 0;3); and 5-year-olds (range: 6;0 to 7;2, M = 6;6, SD = 0;4). While in the True-Belief condition, 4-year-olds already succeeded in ad-hoc implicature derivation above chance level, all children struggled in the False-Belief condition. However, there is a trend of improvement with age. The differences in accuracy with implicature derivation between age groups in the False-Belief condition were statistically significant (Kruskal-Wallis test, $\chi^2(3) = 30.35$, $p < 0.001$). Pairwise comparisons indicated that the adults' performance was significantly different from that of all children groups ($p < 0.001$) and the difference between 6-year-olds and 4-year-olds was marginally

significant (p = 0.053). Although there is some improvement between ages 4 and 7, the results suggest young children did not reason about the speaker's knowledge while deriving ad-hoc implicatures.

PA-22 On the Importance of Infant Carrying for Social Learning and the Development of Social Cognition

Juraj Bánovský

Gymnázium Jura Hronca

I argue that lateral infant carrying could play an important context for the development of social cognition and social learning. Infants spend a significant amount of time in this type of interaction during the age critical for the development of social cognition. It is an under-explored domain with potential relevance to many aspects of social cognition. Carrying allows infants to perceive the world from a perspective similar to that of their parents; to experience joint agency; to perform a broader range of actions and manipulate a variety of objects. Lateral carrying gives them good visual access to socially significant stimuli and aspects of the environment that are relevant to their caregivers, and therefore it might significantly contribute to learning about agents, their actions, mental states, but also objects and their affordances. I suggest how the research on infant carrying could contribute to further understanding of the development of joint attention, action understanding and theory of mind. Infant carrying may also play an important role in the development of the understanding of the we-mode and perhaps also in the formation of associations in the mirror neuron system.

PA-23 What Type of Information Arab Children and Adults in Israel Want to Know About In- and Out-groups

Yara Nassir[1], Meytal Nasie[2], Gil Diesendruck[1]

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Research reveals that intergroup biases emerge early. In Israel, inter-ethnic attitudes appear already in preschoolers (Deeb et al., 2011). One early hypothesis regarding the source of intergroup bias related it to ignorance (Allport, 1954). The argument was that lack of knowledge about the outgroup leads to increased anxiety, and encourages the recruitment of stereotypes about the outgroup (Stephan & Stephan, 1984). The present study asks a fundamental question in this regard: what type of information children and adults are interested in receiving about in-group and out-group members? Israeli Arab kindergarteners (n=40, 50% female, Mage=5.18), 2nd graders (n=36, 61% female, Mage=8.39), and adults (n=40, 50% female, Mage=33.15) saw pictures of an in-group member ("Arab"), a "conflict" out-group member ("Jew"), and a "neutral" out-group member ("Scot"), and were simply asked what they would like to know about each character. Participants' open-ended answers were recorded and then classified by independent judges into different categories; namely: psychological properties, appearance properties, personal identity information, and social identity information. We found

that whereas 2nd graders and adults asked for more psychological information (e.g., preferences, behaviors) regarding out- than in-group members, kindergarteners asked for this type of information to a similar extent regarding in- and out-group members. In turn, kindergarteners asked for more personal identity information (e.g., name, age) regarding in- than out-group members, though 2nd graders and adults did not exhibit this intergroup difference. One potential interpretation of the finding among 2nd graders and adults has to do with the fact that our subjects typically have very little contact with out group members. Thus, whereas they might expect in group members to share with them preferences and behaviors, they may be curious as to whether this is also true of out group members. In general, these findings reveal the relative "gaps" in Israeli Arabs' knowledge of in- and out-groups.

PA-24 Group-biases in Jewish-Israeli children's and adults' preference for information about in- and out-group members

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Intergroup bias, the tendency to evaluate the ingroup more favorably than out-groups, is a destructive social phenomenon that develops at a young age (Nesdale, 2004). An early hypothesis regarding the source of intergroup bias related it to ignorance, holding that lack of knowledge about the out-group encourages the recruitment of stereotypes against it (Allport, 1954). In the present study, we investigated what type and amount of information children and adults wanted to acquire about others, and examined whether their informational preferences were associated with their intergroup attitudes. Israeli-Jewish kindergarteners (n=33, 36% female, Mage =5.48), 2nd graders (n=35, 69% female, Mage=7.88), and adults (n=35, 49% female, Mage=29.6) were shown pictures of three different characters described with their group-membership (ingroup: Jew, "conflict" outgroup: Arab, and "neutral" outgroup: Scot), and asked what they would like to know about each character. Participants produced questions that were classified into four categories: psychological characteristics, appearance, personal identity, and social identity. We also assessed participants' willingness to interact with members of the different groups. Results showed that across ages, participants asked more questions about group identity of out-group than in-group members. Also, whereas 2nd graders asked more about psychological characteristics of all targets, adults asked more about personal identity. There was a correlation between the willingness of 2nd graders to interact with a Jew/an Arab and the number of questions asked about them. In adults, this correlation was found regarding in-group only. This study may provide guidelines for interventions, allowing us to assess how the provision of requested information affects children's and adults' attitudes toward out groups.

PA-25 Daily Routines and Statistical Learning Exploration in Infants

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Both statistical learning (SL; Saffran et al., 1996) and routines in infants' daily experience (Snow & Beals, 2006; Ferretti & Bub, 2017) impact their vocabulary development. While SL is seen as an essential cognitive skill for pattern recognition and language development, it is unclear how it relates to infants' exposure to daily routines, which may be behavioral patterns that unfold over space and time. One hundred and eight 24-month-old infants were recruited for the study (range = 24.02-27.07 months, females = 57). Their Statistical Learning ability was measured through lab-based learning of an artificial language that required mapping novel words to their referents (see Lany et al., 2017). Infants' experience of daily routines was assessed using their comprehensive vocabulary size of routine-related items in the MacArthur Communicative Development Inventory. This included five commonly cited child activities in the literature: bath, breakfast, dinner, lunch, and nap. Results show a significant negative correlation between infants' use of daily routine words and their performance in the word-learning task, $r(61) = -.42$, $p < .001$. More understanding of routine words correlated with lower accuracy and slower task completion. This association remained significant ($B = -1.96$, $SE = 0.79$, $p = 0.01$) even when controlling for sociodemographic factors like maternal education and income. While routines provide structure and consistency, their repetitive nature might slightly limit the exposure to new and varied experiences, which are important for novel word learning. Previous studies (e.g., Cabeza de Baca et al., 2016) indicate that children in very predictable environments may have a more limited awareness of unpredictability. While this does not imply that routines are problematic, it does open up the questions regarding how routine versus unpredictability in infants' environments may differentially support different areas of language development.

PA-26 Actions prime scene recognition in infants

Maja Blesić, Ágnes Melinda Kovács

Central European University

Understanding how infants acquire knowledge about real-world scenes and differentiate between scene categories is essential for cognitive development. Previous studies have shown that infants can categorize familiar scenes and detect object-scene inconsistencies. Here, we investigate whether infants rely on their action understanding to distinguish between scene categories. In our ongoing study, we tested 18-month-olds (currently N = 12, planned N = 24, Mean age = 561.9 days, SD = 5.9 days) in a preferential-looking paradigm with eye-tracking. The experiment consisted of 12 trials in which we first presented infants with background- and object-void videos of a person performing an action (e.g., eating) for 8 seconds, followed by the presentation of two scene images side by side during a 5-second-long test period. The target image represented the scene in which the action was most likely to occur (e.g., kitchen), whereas the distractor image represented the scene in

which the action was less likely to occur (e.g., bedroom). We expected that if infants' scene recognition is primed by the preceding action, we should observe longer looking at the target scene at test. The preliminary analysis of infants' target-looking behaviour during the entire test period (M = 0.56, SD = 0.10) did not reach statistical significance when compared to the chance level of 0.5 (t(11) = 2.0069, p = 0.07, 95% CI = [0.49, 0.62]). However, a cluster-based permutation analysis, in which the proportion of target looking was collapsed into 100ms time intervals and contrasted against chance, revealed two significant intervals in the test phase: from 400 to 1000ms (p = 0.042) and from 1100 to 1700ms (p = 0.024).

These preliminary results suggest that action understanding may play a significant role in how infants represent scenes.

PA-27 Rooting for their own gender: preschoolers' selective preference for winners

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Social hierarchies are inherent in human societies, and gender is one of the most prevalent social hierarchies across ages and cultures. Preschoolers are more likely to associate power and higher status with a male than with a female, and this association is stronger in boys compared to girls (Charafeddine et al., 2020; Mandalaywala & Rhodes, 2020). Though children already represent power as gendered, it is unclear how they evaluate gendered power. In the current work, we examined how children's social preferences for dominant others are shaped by target gender, participant gender, and the type of interaction (same-gender or mixed-gender interactions). We investigated 3 to 6-year-olds' social preferences after watching short videos of two individuals engaged in a zero-sum conflict over a resource. In Experiment 1 (N = 106, Mean age = 5.2 years, 51 girls) children saw two same-gender pairs of adults, and they displayed an overall preference for winners (Mean dominant choices = 63%; binomial test $p < .001$; see Figure 1), regardless of participant gender or winner gender. In Experiment 2 (N = 97, Mean age = 5.3 years, 47 girls) participants watched two mixed-gender conflicts and preferred the dominant individual significantly more often ($p < .001$) when the winner had the same gender as the participant (Mean dominant choices = 80%; see Figure 1) than when the winner was of a different gender (Mean dominant choices = 47%). First, children are sensitive to relative status and use this information to make social decisions. Here, children chose to interact with winners of conflicts in same-gender interactions. However, their preferences are influenced by own-gender biases. Preschoolers favour dominant individuals, but only when their own gender is not at a disadvantage. This suggests that children's dominance evaluations are not independent from those of gender.

PA-28 Pre-schooler's understanding of attentional relationships: The transition from engagement to eye-direction

Catherine Sayer, Eleanor Macfadyen, Martin Doherty
University of East Anglia

The signature limits of two-year-olds' hiding strategies indicate they use non-mentalistic strategies to predict behaviour. In a classic task two-year-olds can hide an object behind a small screen by moving the object, but not by moving the screen (McGuigan & Doherty, 2002). We argue pre-schoolers understand attention in non-mentalistic terms of agents' general involvement, or 'engagement' with objects. From experience, children infer that adults are more likely to engage with objects that they have previously had perceptual access to. The move-screen condition is difficult because the agent has had perceptual access. Moving the screen stops them seeing it but does not stop them being engaged with it. Here we independently manipulate seeing and engagement by introducing a blindfold. With 172 children aged 24 to 54 months (mean age = 41 months, SD = 7) we replicate the original effect and show that using a blindfold to prevent initial engagement improves performance. However, the blindfold also improved performance when the agent was already engaged with it. This may reflect difficulties reconstructing exposure history (see Király et al., 2018). Standard move-screen performance was significantly associated with tests of gaze judgement (Doherty et al., 2009) suggesting development of an adult-like understanding of seeing. We conclude sophisticated hiding ability marks the transition from a behavioural strategy to mentalistic theory of mind.

PA-29 Children rationally maximise in response to inequity in an online, interdependent delay of gratification task

Charlotte Savill, Bahar Koymen, Keith Jensen
University of Manchester

Rational maximisation theory predicts that individuals should act in their own best interest; however, human behaviour often deviates from this model. Whilst norms of fairness can stabilise interactions between individuals with competing interests, it can also lead to irrational behaviour. Responses to disadvantageous inequity (receiving less than a peer) show that children sometimes reject unfavourable outcomes, even if this means gaining less overall. This irrational response has been shown in children as young as 4-years-old and may involve uniquely human processes of social comparison. Another process important to rationality is the ability resist immediate rewards in favour of long-term benefits, known as delay of gratification. We set up a novel, online interdependent delay of gratification experiment with 5-6-year-old children. In our interdependent paradigm, children must resist eating a food treat for 10 minutes to get a second reward, but the outcome is interlinked with the actions of a confederate partner on Zoom: both children must wait. If either one eats the first treat, neither get an extra treat. To investigate the influence of fairness on children's inhibitory control, we manipulated the reward distribution such that children received either an equal (fair) or

disadvantageous (unfair) outcome. Whilst children were less satisfied with the result of the task in the unfair condition, there was no significant difference in children's delay of gratification when rewards were equal or disadvantageously split with a confederate partner. In contrast to research on fairness, when faced with inequity in this task, children rationally maximised their own future outcome. We discuss the links between inhibitory control, fairness, and the factors promoting rational over spiteful behaviour in response to inequity in children.

PA-30 Infants' neural entrainment in response to visual regularities

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Visual statistical learning refers to the ability to detect and extract regularities from the environment. Thus far, infancy research has mostly investigated this ability with post-exposure behavioural tasks which only reveal the outcome of learning. Notably, behavioural tasks may lead to ambiguous interpretations since there is no clear consensus about the directionality of the expected learning outcome. Electrophysiological measures such as steady-state visual evoked potentials (SSVEPs) can be acquired while learning occurs and can shed light onto the temporal course of learning. At present, SSVEPs investigations of the ongoing learning processes have been limited to the auditory domain (Choi et al., 2020). In this study, we use SSVEPs to investigate infants' neural entrainment mechanisms in response to visual regularities. Four- to six-month-old infants were presented with 20 s streams of 8 colourful shapes appearing in the centre of the screen at a frequency of 6 Hz. They were randomly assigned to one of three conditions: 1) standard doublet, in which shapes were organised in 4 doublets, 2) control doublet, in which shapes formed 16 doublets, and 3) random. We compared SSVEPs at the frequency of visual stimulation (6 Hz and its harmonics) and at the doublet frequency (3 Hz and its harmonics) across conditions. If the condition included visual regularities, we hypothesised a progressive response at 3 Hz. Results revealed neural entrainment at the base frequency that did not differ across conditions. This confirmed that infants were similarly attending to the visual stream of stimuli. On the other side, activity at the doublet frequency varied across conditions. Infants assigned to the doublet conditions showed greater responses at the doublet frequency, especially at 9 Hz, compared to the random condition. Overall, these results suggest that the infant brain can detect visual regularities in a stream of shapes from very early on.

PA-31 When the past serves the future: Exploration of episodic future thinking among preschoolers

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University of Liège

Episodic future thinking (EFT) – i.e., the ability to imagine specific experiences that might occur in one's personal future – is a crucial skill, essential for many cognitive (e.g., planning) and socio-emotional (e.g., emotion regulation) abilities (Conway et al., 2019). Its development begins during the preschool years, but little is known about the mechanisms underlying this process (Busby & Suddendorf, 2005). A common assumption is that EFT relies on the memory of personal experiences (Schacter et al., 2017). In this perspective, our study explored whether preschoolers' EFT is related to (a) their memory performance, and (b) the way their parents engage them in conversations about past events, referred to as parental reminiscing style. To this end, 50 French-speaking parent-child dyads were recruited. Children were asked to perform an EFT task in which they had to describe three activities they would do the next day. They also completed several memory tasks: two tasks assessing the accuracy of their memories about previously experienced standardized events and one laboratory memory task evaluating their ability to memorize new information (the House Test, Picard et al., 2012). To determine parental reminiscing style, we analyzed parent-child discussions of a prior standardized event (a museum visit). The results first revealed that children's EFT was positively associated with their performance on the encoding and recognition phases of the laboratory memory task. Then, we showed that some specific components of parental reminiscing style (i.e., repetitions and metamemory talk) were positively associated with children's EFT. Importantly, these findings have allowed us to hypothesize about the cognitive processes potentially involved in the early acquisition of EFT (e.g., binding processes) and, more broadly, converge with literature that states the role of parental reminiscing as a key determinant of early cognitive development (Fivush, 2019).

PA-32 The Role of Cognitive Flexibility in Early Numeracy Performances

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University of Haifa

This study aimed to investigate the developmental role of cognitive flexibility (CF) in the early numerical performance of Hebrew-speaking kindergarten and first-grade children. A total of 1,030 kindergarteners participated in this study, of whom we followed 690 to the first grade. Executive-functions are a high-level neuro-cognitive process that facilitates goal achievement and problem-solving in a complex situation (Miyake et al., 2000). CF is one of the three main executive-functions (working memory and inhibition). CF involves the capacity to simultaneously change perspective within a given mental framework (Cartwright et al., 2017), something that is required in mathematical performance (De Santana et al., 2022), and has been found to play a significant role in different mathematical abilities.

However, most studies on CF and its connection to numerical performance have been cross-sectional studies. Hence, the current study was designed to explore the role of CF within a longitudinal developmental framework. Moreover, it aimed to explore the extent of CF's influence across a wide range of early numeracy sub-domains tasks (calculation, number knowledge, comparisons), which previous studies have demonstrated their predictive potential for later mathematical performance during the elementary school.

The current study examined various early numeracy tasks, employed a factor-analysis to group the numerical data into sub-domains, correlations and regressions, integrating background variables as covariates. Results revealed a substantial contribution of CF—around 3-12%– to each of the tested numerical sub-domains across both periods. Notably, higher levels of CF corresponded to heightened numerical performance across both ages. Particularly impactful was CF's contribution to the sub-field of calculations during both developmental stages. Following these findings, it is worth considering the examination of CF in kindergarten and first-grade children due to its ability to explain some of the early numerical performance.

PA-33 Does imitation in infancy and early childhood explain conformity to social norms in early childhood?

Charlotte Knapper[1], Sophie Marshall[1], Santa Atim[2], Agnes Ayikoru[2], Georgia Birchenough[1], Joanna Buryn-Weitzel[1], Ed Donnellan[3], Kirsty Graham[4], Maggie Hoffman[5], Eve Holden[4], Michael Jurua[2], Nicole Lahiff[6], Ellen Lavender[1], Josephine Paricia[2], Beatrice Peringa[2], Florence Tusiime[2], Claudia Wilke[1], Rebecca Willis[1], Katie Slocombe[1], Bailey House[2]

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Following society's social norms (i.e. unwritten rules of social behaviour) can impact how children are accepted as members of their social group. Some propose that children's conformity to social norms develops out of their early-emerging ability to imitate others. Previous research has found that imitation predicts compliance in children younger than 2 years old, but this research is limited to Western societies, and fails to explore whether imitation predicts conformity after age 3, when children's understanding of norms begins to develop. Here, we investigate the link between imitation and conformity to social norms in children aged 4-5 years, in two samples of children from the UK and Uganda. We measured children's imitation ability at 1.5 years and 4 years, along with their tendency to conform to novel game rules at 4 years. We predicted that children who were more likely to imitate others would also be more likely to conform to novel game rules. To rule out a relationship between imitation and norm conformity being driven by more general cognitive abilities we also explored general cognitive skills at 11 months as a predictor of conformity to game rules at 4 years. Contrary to these predictions, conformity at 4 years was not predicted by children's imitation at either 1.5 or 4 years of age. Instead, conformity at 4 years was negatively predicted by children's general cognitive abilities earlier in infancy, though this was specific to Uganda. Our results suggest that conformity

to norms such as game rules is unlikely to be supported by children's imitation abilities, and that the role of other cognitive abilities should be explored. Our findings also suggest that the emergence of conforming behaviour is not the same across UK and Ugandan societies, highlighting the importance of further research with non-Western societies.

PA-34 Does the salience of information disrupt children's preference for sharing generic information to others?

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Lancaster University

Previous findings show that children tend to share information that is generalizable to a kind (e.g., "Bird have beaks") rather than specific ("This bird has a long neck"). However, systematic investigations of such preference are lacking, and it is unknown whether generalizability preference for transmission is retained when the nature of information is not neutral.

Upon conceptually replicating that children preferentially share generic information about neutral topics (Exp.1), we extend this line of research to salient-threatening (Exp.2) and health-related (Exp.3) information domains. Children aged 6-9 (N = 36 per experiment) were tested in an interactive online paradigm with four trials comprised of learning and transmission phases. In each trial, they first learned two generic and two specific facts about a familiar animal or a natural phenomenon. In the subsequent transmission phase, children were introduced to a friendly cartoon alien character – a naïve social partner eager to learn about world – and asked to share any facts learned. We coded the first fact and the overall number of generic and specific facts transmitted. In Exp.1, when information was neutral (e.g., familiar facts about dogs and birds), children showed a preference for transmitting generic facts, both as first chosen facts and the overall number of facts shared. However, in Exp.2, when the information was about a salient-threatening topic (e.g., familiar facts about germs and snakes), children's preference for transmitting generic facts both as first chosen fact and the overall of number of facts shared was disrupted. Cross-study comparisons on both outcome measures were statistically significant. In Exp.3, children are presented with health-related generic and specific facts about animals (N = 23, ongoing). These preliminary findings suggest that children's tendency to teach generic-as-default may be disrupted by information saliency, challenging, theoretical understanding of cognitive mechanisms of knowledge transmission.

PA-35 The Effect of Parental Playfulness on Preschoolers' Social Problem Solving Skills: The Mediating Role of Emotion Regulation

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Maltepe University

Parental playfulness refers to parents' ability to act in a spontaneous, amusing, flexible and creative manner in various parent–child interactive contexts. Recent evidence suggests association between parental playfulness and children's social and emotional development (Levavi et al., 2020; Shorer et al., 2019). In addition, research has shown that mothers' playfulness was related to children's emotion regulation and emotional coping strategies was found to be important in the development of preschooler's prosocial behaviour (Cabrera et al., 2017; Blair et al.,2004). The goal of the current study is to test whether children's emotion regulation mediates the relationship between parental playfulness and children's social problem solving. The final sample will consist of 60 4-6 year-old children. Data collection is still ongoing. The current report includes preliminary analysis on data from 11 mother-child dyads. Parent playfulness was assessed through 10 min. parent-child play interaction (Garcia et al., 2017). Children's social problem-solving skills were evaluated using Wally Social Problem Solving Test (Kayılı and Arı, 2013). Children's emotion regulation was measured through mother self-report via Emotion Regulation Checklist (Shields and Cicchetti, 1997).

Our preliminary analyses revealed a statistically significant positive relationship between children's age and social problem-solving skills ($r = .74$, $p < .05$) and also indicated a moderate positive correlation between parental playfulness and children's social problem-solving skills ($r = .46$, $p > .05$). However, there was no significant relationship between parental playfulness and children's emotion regulation abilities ($p > .05$). In order to test the main hypothesis of the study, a mediation analysis will be run upon completion of data collection. These early results suggest that parental playfulness might play a meaningful role in enhancing children's ability to navigate social challenges. The current study offers a promising starting point to investigate the underlying mechanism for the relationship between parental playfulness and children's social-emotional development.

PA-36 Aging Decentralizes the Mental Lexicon into Local Communities

Dasol Jeong, Thomas Hills
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The mental lexicon changes across the lifespan. Prior work has aggregated data among individuals of similar ages to reveal that the aging lexicon, represented as a network of free associations, shows a pattern of decreasing centralization: degree and clustering coefficient decrease with age, and average shortest path length increased. However, because this work is based on aggregated data, it remains to be seen whether or not individuals also show a similar pattern. In this work, we

demonstrate how an individual level approach can be taken to reveal individual differences that vary systematically with age. Our approach follows the logic of many past approaches, comparing individual data with population level measures. Using a different aggregate level measure, we first demonstrate the robustness of past findings on free association networks using an aggregate-level analysis. We then describe an individual-level analysis that shows how older free associations are both more decentralized, but also focus on more clustered regions of the population-level network representation: degree, weighted degree, betweenness centrality, closeness centrality and eigenvector centrality decrease for the free associations produced across the life span, but clustering coefficient increases. Further extending prior aggregate-level approaches, we also demonstrate these results for three difficult languages: English, Spanish, and Dutch. This suggests older adult knowledge focuses on communities of associations that are more decentralized. These results reveal how individual-level approaches can be taken with aggregate data and demonstrate new insights into understanding the aging lexicon.

PA-37 The Impact of Emotional States on Reading and Writing Performance in Children

Gisella Decarli, Simone Zasso, Laura Franchin
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Many studies have provided evidence for the impact of emotions on learning processes. While it's widely acknowledged that emotions influence memory retention and recall, the question of how emotions precisely affect the learning process remains still controversial (Tyng et al., 2017). On one hand, some studies reported that positive emotions play a role in fostering learning academic achievement, with the mediation of self-motivation and satisfaction for learning materials (e.g., Um et al., 2012). On the other hand, negative emotional states, such as stress, can either facilitate or hinder learning and memory, depending on their intensity and duration (e.g., Vogel & Schwabe, 2016). Hence, the aim of the present study was to assess the impact of positive, negative and neutral emotions on the training of reading and writing tasks among school-aged children. Initially, we tested 85 children (mean age = 6 years and 7 months, range = 6 years – 8 years) in a reading and writing tasks of pseudo-words, prior the training session. Then, participants were randomly assigned to distinct emotional conditions in which different cartoon videos were used to elicit specific emotional states (negative, positive or neutral) and they were trained to learn the pseudo-words. Following the training phase, they were re-tested with the reading and writing tasks. We found improvements in all conditions and in both tasks, whereas a significant higher improvement was demonstrated in the accuracies of reading and writing for the positive emotion condition compared to neutral one.

PA-38 Is early infant temperament predictive for the onset of index-finger pointing?

Dennis Feyerabend, Ulf Liszkowski
University of Hamburg

Index-finger pointing is a crucial milestone in the communicative development of infants and predictive for subsequent language development (Bates et al., 1975). While previous research has established the importance of social-interactional experiences for the onset of pointing, infant-intrinsic characteristics that contribute to the substantial variability in the age of emergence remain poorly understood (age range from 8 to 12 months; Rüther et al., 2023). The recently formulated "Fearful Ape Hypothesis" suggested that heightened levels of fearfulness may serve to elicit increased attention from caregivers and to be positively associated with social-cognitive competencies in infants (Grossmann, 2023). Furthermore, higher levels of extraversion have been linked to enhanced early language abilities in infants (Laake & Bridgett, 2014; Davison et al., 2019). Taken together, higher levels of extraversion and/or fearfulness might be positively associated with the onset of pointing. The present study aims to investigate, whether individual differences in infant extraversion and fearfulness are predictive for variations in the onset and the frequency of index-finger pointing. This study involved a longitudinal approach with 132 infants. Early differences in temperament were assessed at 4 and 7 months of age. During the 4-month visits, we observed infants' motor- and emotional reactivity in response to novel auditory and visual stimuli. At the 7-month assessment, parents were asked to rate specific temperament-related behaviors of their infants via an online questionnaire (IBQ-R, Gartstein & Rothbart, 2003). The onset of infant index pointing was determined through monthly parent reports on the observed frequency of different infant behaviors (to mask the focus on pointing). Differences in infant pointing frequencies were observed during a second lab visit when infants were between 11 to 12 months of age (Decorated Room paradigm). Data collection and behavioral coding have already been completed and we are currently conducting inferential analyses on the collected sample.

PA-39 Tracking others' epistemic vigilance: Do children trust vigilant informants more than gullible ones?

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Humans are endowed with a suite of cognitive mechanisms that allow them to face the risk of misinformation and underlie their 'epistemic vigilance' (Sperber et al., 2010). Vigilant receivers evaluate the reliability of the source of information and the credibility of its content, and modulate their acceptance of communicated information accordingly. When they have no direct access to the primary source of information, individuals may rely on each other's vigilance to acquire beliefs. However, little is known of the human's capacity to track others' epistemic vigilance and use this information

to guide their trust choices (also known as 'second-order vigilance', Mazzarella & Pouscoulous 2021). This study investigates the emergence of second-order vigilance towards misinformation in early and middle childhood. We designed a selective trust task involving a 'generalizable knowledge' gain: learning unfamiliar object names. During the test phase, children did not have access to the testimony of the primary source of information (the Inaccurate Source) but were presented with the conflicting testimonies of a Gullible Informant (who systematically trusted the Inaccurate Source in the past) and a Vigilant one (who systematically mistrusted the Inaccurate Source in the past). Crucially, both informants had no direct information on the label of the object but relied on what the primary source told them unbeknownst to the child. When do children start to selectively trust vigilant over gullible informants? We tested four- to seven-year-olds (N = 119, divided into four class level groups) children's propensity to choose the label endorsed by the Gullible/Vigilant informants as a measure of their second-order epistemic vigilance. Our findings revealed that children preferred to trust a vigilant informant over a gullible one starting from the age of 6.

PA-40 Speech errors and language innovations in the narratives of Kyrgyz-Russian bilingual children

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The study is devoted to the analysis of Russian language narratives produced by Kyrgyz-Russian bilingual children. The question on the mechanisms that are involved in the acquisition of the Russian language by bilingual children is widely studied on the material of the speech of bilinguals, speaking Russian as a native language, but not the dominant one, i.e. Russian-Swedish, Russian-Dutch or Russian-German bilinguals. In this study, we consider a situation where Russian is one of the two official languages of the country and the most relevant one for the child. The informants of the experimental study are preschool children permanently residing in Kyrgyzstan (Bishkek), n=15, age 4.5–6 years. The data were collected using the Litmus MAIN instrument. The informants were asked to produce a story based on the set of pictures. The narratives (n=25) were recorded, transcribed and analysed.

The analysis of the material shows that our informants widely used the same speech strategies as bilingual children acquiring Russian as a non-dominant language. A large part of speech errors is due to the interference/transfer from the second language (ex., non-distinguishing between genders) and the simplification strategy (ex., using "frozen" or initial forms). Along with this, we have noted numerous innovations that are characteristic of Russian-speaking monolingual children of earlier age. They arise from the strategies of generalization (ex., paradigm leveling) and compensation (ex., using gestures and pronouns instead of a forgotten noun). Finally, some errors remind those usual in Russian children with atypical speech development (ex., using word forms without regard to the context). The errors were of similar nature, while the Russian input had different quantity and

quality. This indicates the desire of both bilingual and monolingual children to simplify linguistic phenomena, which is probably the optimal cognitive strategy in the situation of parallel learning of several languages.

PA-41 Encoding novel labels based on speaker's mental state in 19-month-old infants

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University of Copenhagen

Previously, Southgate, et al. (2010) found that 17-month-old infants infer the intended referent of a communicator based on her mental state. When a person pointed towards one of two locations to request an object, infants gave the object from the other box when she had a false belief (FB), raising the question if they inferred that the pointed-at object is not called by that label. We tested whether 19-month-olds infer that an unfamiliar object is being labelled incorrectly vs. incorrectly depending on the labeller's belief about the target. Infants saw an agent put an unfamiliar object in a box, then the object was swapped to another, witnessed (TB) or not (FB) by the agent. Finally, the agent pointed to the box, and provided a novel label (a pseudoword). We built on the N400-effect (Kutas & Federmeier, 2011), an increased negative ERP ~400-600ms after stimulus onset in response to higher semantic processing demand. Infants' EEG was recorded, and vocabulary assessed via parent-report CDI. We predicted if infants detect the label in FB as incongruent, to observe a larger N400 in FB than TB. We found and N400-effect as a function of the agent's belief, however, in the opposite direction as predicted. At posterior sites (e.g., Forgács et al., 2020), 400-600ms after word onset, we observed a higher negativity in TB ($t(33)= -2.09$, $p=.045$, 95% CI [-5.46 -.07], $M= -2.77\mu V$, $SD= 7.75$, two-tailed), 24/34 infants showed this difference. Crucially, there was a high correlation between the N400 effect and receptive vocabulary, Pearson's $r(24)= -.734$, $p<.001$.
One way of making sense of this unexpected finding, especially given the strong correlation with the CDI, is that infants did consider the agent's mental state, but restricted their attempt at semantic integration (encoding) to the TB events where the agent's labelling is informative.

PA-42 Reminiscing or playing? The power of early parent-child metacognitive interactions across contexts

Marion Gardier, Christina Léonard, Marie Geurten
University of Liege

To date, the key role of parents in child development is well established in many domains. For instance, it has been recently suggested that variations in the metacognitive information provided by parents when playing with their child could be related to children's metacognitive performance

(Geurten & Léonard, 2023) and that parent's comments during parent-child reminiscences were associated with both preschoolers' metacognitive and memory performance (Léonard et al., 2023). Such findings raise the question of the stability of this parental metacognitive talk across different parent-child interaction contexts and whether some contexts are more beneficial than others to stimulate children's cognitive development. For this purpose, 64 preschoolers (34 girls; Mage=40.3 months, SDage=6.3) and one of their parents (59 mothers) were invited to (a) play together to various memory games and (b) participate in a reminiscence about a standardized event. In both contexts, parent-child interactions were recorded and then coded for metacognitive content considering two mutually exclusive codes: metacognitive monitoring and metacognitive control. Then, to assess children's episodic memory, preschoolers completed a story-recall task in the form of a true-false recognition about a previously heard story. Correlations analysis revealed a link between parental metacognitive talk across the two dyadic interaction contexts. Occurrences intended to support metacognitive monitoring, however, were more frequent during reminiscing interactions while occurrences supporting metacognitive control were more frequent during play interactions. Regarding memory performance, mixed models showed that children's memory accuracy in the story-recall task was positively associated with parents' metacognitive talk in both contexts. Specifically, producing a high level of metacognitive comments both when playing and when reminiscing seems to be the best combination to improve children's memory performance. Overall, our data support both similarities and differences in parental metacognitive talk across contexts and an early influence of these metacognitive interactions on children's memory performance.

PA-43 Learning from Expectancy-Violations: Does generating predictions promote lasting conceptual change in children?

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DIPF | Leibniz-Institut für Bildungsforschung und Bildungsinformation

Conceptual change from a naïve theory to a scientific concept is a tedious process in which learners often perceive a meaningful conflict between their misconception and the scientific concept (Vosniadou & Ioannides, 1998; Limón, 2001). Meaningful conflict occurs when children are presented with evidence that they perceive to be violating their beliefs and that they cannot "explain away" (Bonawitz et al., 2012). Expectancy-violating evidence thus leads to conceptual change only if it first leads to a meaningful conflict (Limón, 2001). One way to promote meaningful conflict is to let learners generate predictions before seeing the correct outcome. Letting participants generate a prediction before presenting them with expectancy-violating evidence has repeatedly been shown to boost surprise (Brod, 2021). Moreover, Theobald and Brod (2021) found that letting children generate predictions before presenting the correct outcome also boosted short-term revision of simple misconceptions. In the present study, we aim to test whether generating predictions also facilitates lasting conceptual change in children during a more complex task. Children (aged 7 – 10) learn about balance in a balance scale task (Siegler, 1976). The study follows a between-subject

design with five phases: 1) pretest, 2) learning phase, 3) posttest, 4) transfer test, 5) delayed post- and transfer test. In a computerized task, children see a balance scale with varying amounts of weights placed at varying distances from the fulcrum. Children state their expectations about which side of the scale goes down or whether the scale stays balanced either before seeing the correct answer (prediction condition) or after (postdiction condition). During the learning phase, pupil size is recorded via pupillometry and is used to assess the pupillary surprise response to incorrectly solved trials. This study will advance our understanding of children's learning from expectancy-violations and will have implications for how to teach science concepts.

PA-44 Monitoring and Control Processes within Executive Functions: Is Post-Error Slowing Related to Pre-Error Speeding in Children?

Ebru Ger, Claudia Roebers

University of Bern

Both pre-error speeding and post-error slowing in multi-trial executive function tasks reflect monitoring and control strategies. While post-error slowing is well-documented in children, pre-error speeding remains relatively understudied. In this study, we examined two main questions: (1) Do kindergarten and school children exhibit pre-error speeding during an executive function task? (2) If so, is there a relationship between pre-error speeding and post-error slowing? We examined data collected from 153 kindergarteners and 468 first-graders on the Flowers and Mixed blocks of the Hearts and Flowers task, taxing inhibition and shifting, respectively. Both groups, kindergarten and first-grade children, displayed significant pre-error speeding in both the Flowers block (kindergarten: $t(144) = -4.17$, $p < .001$; first grade: $t(445) = -6.39$, $p < .001$), and the Mixed block (kindergarten: $t(152) = -4.20$, $p < .001$; first grade: $t(465) = -5.33$, $p < .001$). Specifically, in the run of correct trials before an error, children accelerated their response speed (14 ms and 13 ms per trial in the Flowers block and 17 ms, 12 ms per trial in the Mixed block, respectively for kindergarten and school children). Additionally, we observed a correlation between the degree of pre-error speeding and post-error slowing within each individual in both groups (see Figure 1), and this correlation was similar in magnitude in both groups. In other words, children who exhibited more pronounced acceleration in response speed before making an error also exhibited more significant deceleration in response speed after committing an error. These findings suggest that both pre-error speeding and post-error slowing may be interconnected in children as early as kindergarten age and might collectively represent how effectively children monitor and regulate their performance in an executive function task.

PA-45 Gravitational Pull of Reality Weakens on Planet Fantasy: Younger Children Benefit from Fantastical Stories in False-Belief Reasoning

Ece Tuğlacı, Hande Ilgaz
Bilkent University

The current study includes two experiments investigating whether higher fantasy content in false belief (FB) scenarios supports children's FB reasoning. Children's adherence to the true state of affairs in FB tasks may be due to the curse of knowledge (Farrar & Ostojic, 2018) and/or the egocentric bias (Epley et al., 2004). In the current study, the fantasy content of FB scenarios was manipulated with the expectation that higher fantasy content would make it easier for children to override the pull of the true state of affairs.
In Study 1, ninety Turkish children (3-year-olds, M= 3;7, 4-year-olds, M= 4;6, 5-year-olds, M= 5;5) completed four FB tasks (fantastical and realistic unexpected contents; fantastical and realistic change-of-location), and executive functions (EF) task. A mixed design ANOVA on FB scores with age and task order (fantastical tasks-first or realistic tasks-first) as between-subjects factors and degree of fantasy as the within-subjects factor was carried out. There was a main effect of the degree of fantasy when children's EF abilities were controlled. The interaction of age by task order was marginally significant ($p = .06$). Study 1 showed that reality distancing (i.e., higher fantasy) supported children's FB reasoning. Study 2 included an additional fantasy orientation measure (Eisen, Taggart & Lillard, 2023) to investigate the possible effects of children's fantasy orientation. Ninety Turkish children (3-year-olds, M= 3;5, 5-year-olds, M= 5;5) completed the same FB tasks, a fantasy orientation measure and DDCS (Zelazo, 2006). Results replicated the main effect of the degree of fantasy when EF was controlled. Furthermore, the interaction of age and order was significant, where 3-year-olds performed especially better when they received the higher fantasy version of the FB tasks first. This finding was congruent with Study 1. The results contribute to possible ways fantasy can aid children's reasoning about others' minds.

PA-46 Pragmatic understanding in infants' mind: Addressing the developmental puzzle

Edoardo Vaccargiu
University of Neuchâtel

It is widely assumed that pragmatic understanding relies on the ability to attribute communicative intentions, but this ability appears puzzling when it comes to language-lacking interpreters, such as human infants. From one year old, infants start to understand the different meanings of pointing gestures which, like utterances in context, require a form of pragmatic understanding to be interpreted. Post-Gricean models (Sperber & Wilson, 1995) fruitfully explain the cognitive underpinnings of human communication, but philosophers and psychologists question the plausibility of a full-blown post-Gricean analysis of pragmatic understanding in infancy (Breheny, 2006; Moore, 2017). Can such models

offer a suitable account of pragmatic understanding in the early stages of cognitive development? Do infants actually possess the cognitive resources required to pragmatically understand in a post-Gricean way? This talk aims to address this developmental puzzle from a renewed post-Gricean perspective. On preliminary grounds, I will disentangle two facets of the puzzle by recasting it as a twofold dilemma: the Nesting dilemma and the High Order Thoughts dilemma. Then, I will critically discuss two alternative routes proposed in the literature to deal with them: the modularist and the minimalist routes. Lastly, I will draw from developmental (Csibra, 2010) and comparative research on ostension (Gómez, 1994) to outline a third, middle route to handle such developmental dilemmas in a more empirically informed way.

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PA-47 How does the perspective of gesture presentation affect children's spatial performances?

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Using spatial language, including visuospatial directive information and the speaker's gesture use, enhances the children's spatial performances (Austin & Sweller, 2014; Simms & Gentner, 2019). However, while the speaker's gestures are presented to children, the perspective, upper-back angle for the hands of the speaker, has not been investigated yet; it is an emergent context in online educational tools. Thus, this study investigates children's performance on the visuo-spatial map in varying speaker conditions: speech-only, speech-gesture, and speech-gesture from upper-back angle. Monolingual Turkish children aged between 5-6 years have been included in the study. The Directions Task has been used as the primary stimulus presented on a tablet screen. Children have been shown route descriptions on visuospatial maps. Route descriptions have been presented with a video of the speaker on the upper right corner of the screen. Descriptions are based on speech-only, speech-gesture, and speech-upper-back gesture conditions. The speaker's face is not visible in all conditions, yet her speech is present. Three stimuli per condition, each with a different road path, have been presented. After each stimulus, children were asked to describe the road verbally and then show the path by drawing on a printed map. The Ghost Task, PTT-C, RMTS, and The Frog Story have been included to assess children's spatial abilities. Two ANCOVA analyses will be used, and the behavioral performance (correctness of the road drawn by children) and verbal descriptions of children have been considered dependent variables. The

conditions (speech-no gesture, speech-gesture, speech-upper back gestures) of the Directions task have been considered independent variables.
Children are expected to perform better in the speech-gesture condition than in the no-gesture condition. The effect of the speech-upper-back gestures condition will be explored; however, it is expected to affect children's performances more than the no-gesture condition but lower than the gesture condition.

PA-48 Does the semantic system function mentalistically right from its developmental onset?

Bálint Forgács[1], Eugenio Parise[2], Judit Gervain[3], Nóra Berkes[1], Adél Szigeti[1], Ildikó Király[1]
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Recent findings on the so-called social N400 response suggest that the semantic system is sensitive to mentalistic manipulations, independent of semantic processing load. The social N400 seem to have two components in adults: 1) a false belief social N400, elicited by tracking the false belief based semantic miscomprehension of a social partner; 2) a social presence N400, evoked by the mere presence of another person. Prior studies have found that the false belief N400 is apparent already in 14-month-olds, right at the developmental onset of the typical N400. The current study investigated the social presence N400 in infants. We labelled objects correctly or incorrectly, either in the presence or the absence of a social partner, while measured event-related potentials (ERPs). We employed a within- (presence vs. alone) and between-subject design (congruent vs. incongruent labels) given that no more than two conditions are feasible in infant EEG experiments. Our findings revealed that, unlike adults, infants showed a social presence N400 effect only in the incongruent labeling condition, not in the congruent condition. No other ERPs were observed. We did not succeed in eliciting a typical N400, but given that this effect is well-replicated, infant between-subject ERP measures have low power, and our main interest was the social presence effect, we believe it is not of great concern for the goals of our study. The social presence effect suggests that the semantic system computes meanings based on attribution not only of communicative intentions but of specific beliefs. The fact that no other ERPs were observed corroborates the interpretation that the semantic system functions mentalistically, right from its developmental onset.

PA-49 Adapting to change: A fundamental, early-emerging, transdiagnostic learning process?

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An infant's world is characterized by high levels of uncertainty, as much of their physical and social environment is still unknown. This inherent uncertainty is further compounded as infants develop, with their perceptual, motor, and cognitive skills undergoing a rapid transformation that keeps

changing the way they experience the world. A central question arises: How do infants learn under these continuously changing conditions? To address this, we tracked infants' pupil dilation during a novel learning task. Within this task, the location of a reward was systematically altered, transitioning from periods of stability to periods of volatility. Relating pupil dilation data to a computational model, we identified the learning processes that enabled infants to navigate and adapt to changing environments. We found that infants' tonic pupil dilation reflected the level of environmental uncertainty estimated by the model. Moreover, phasic changes in pupil dilation when observing the reward indicated that infants adjusted their internal representation of the task space depending on the environmental uncertainty. Specifically, when uncertainty was low, infants valued previous information and disregarded unexpected events; when uncertainty was high, they disregarded what they had previously learned and prioritized novel information. Utilizing generalized additive models, we also observed individual differences across infants and explored their correlation with temperament. Our research suggests that the ability of infants to flexibly adapt to change might have far-reaching implications, influencing various cognitive and emotional domains. We propose that this adaptability could serve as a promising transdiagnostic tool for identifying developmental disorders.

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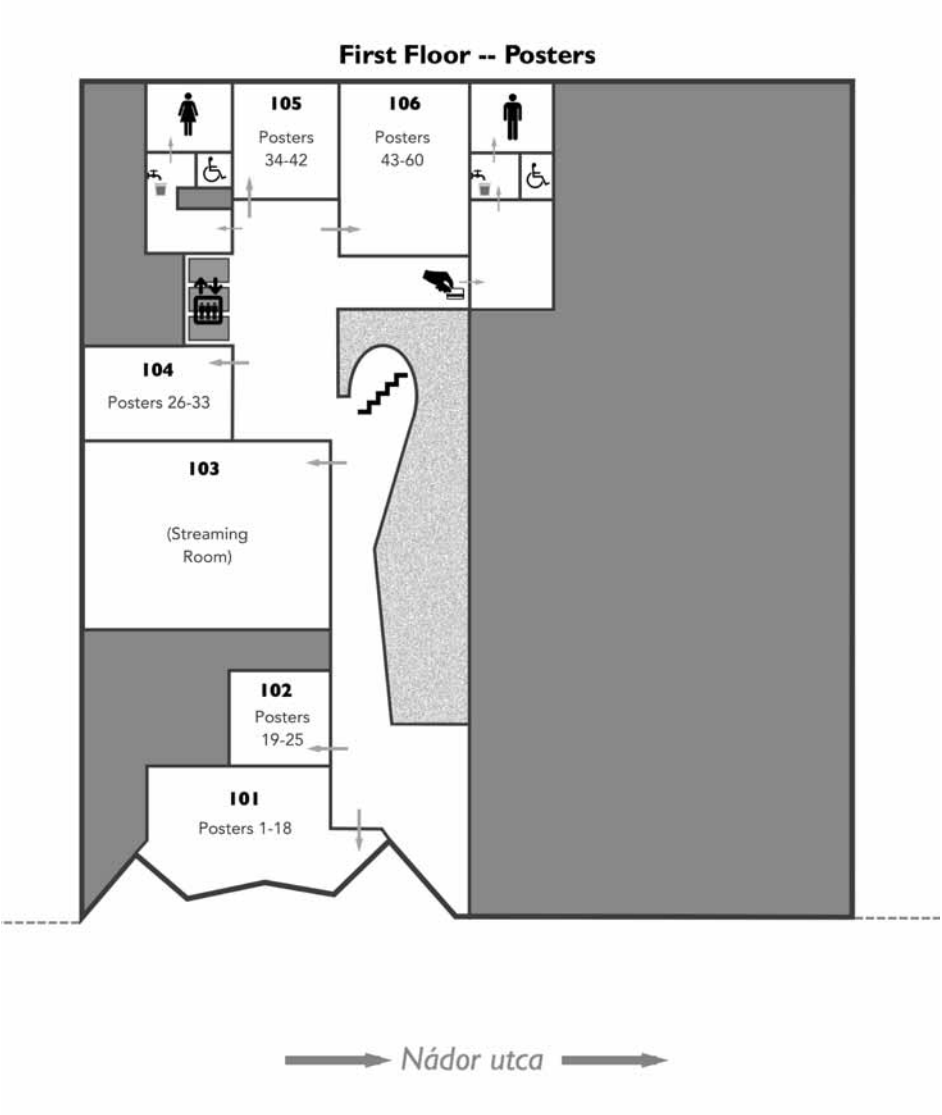

POSTER SESSION B
FRIDAY

PB-01 Infants expect an agent to choose a goal that can be reached at a lower cost

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Research on the early understanding of goal-directed actions shows that infants expect agents to behave efficiently by minimizing action costs when bringing about goals (Gergely & Csibra, 2003; Jara-Ettinger et al., 2016). However, it is unknown whether infants merely expect agents to act efficiently when pursuing the only goal available, or whether they can compare alternative goal options (see Liu et al., 2017) and assume the agent will choose the one requiring the least effort. Here, we addressed this question using eye-tracking. Specifically, we investigated whether 14- to 16-month-olds (n = 48) would anticipate that an agent presented with two identical objects would select the one that was less costly to reach. Infants were familiarized with an event where an agent approached an object by passing through an opening in a wall; the object and opening were located either close to or far from the agent. At test, there were two openings, one close and one far, either with an object behind each ("two-goals" trial), or with none ("no-goal" trial). The test videos ended before the agent approached either of the options and infants' gaze was recorded. We predicted that if infants expected an agent to choose the goal that could be reached at a lower cost, they should direct more looks to the closer opening/object in the "two-goals" trials, but show no preference in the "no-goal" trials (preregistration: https://osf.io/cws8z/?view_only=7ed87c1c8ce94091b0aac72a8c5705ed). Our results were in line with this prediction (Bayes factor for proportion of looks to the closer option in "two-goals" condition: 135, in the "no-goal" condition: 0.1). These findings provide initial evidence that, beyond evaluating the efficiency of an action directed at a single goal, infants can assess which of two potential goal options, assuming they are equally rewarding, minimizes an agent's overall effort.

PB-02 What is it for? The role of shared language in limiting children's spontaneous exploration of object functions

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From an early age on children selectively acquire cognitively opaque knowledge forms from informants who speak the same language as them. Especially when it comes to the proper functions of artifacts, which is generalizable and normatively prescribed, children might rely on pedagogical demonstrations delivered only by their linguistic group members in learning what the artifact ought to be used for and persevere with its demonstrated function despite the artifact serving several other functions. Here we test this hypothesis by investigating whether a model's group membership (native vs. foreign language) influences children's exploratory actions on a novel object after they observe the model

demonstrating one of its functions. Building on a classic study by Bonawitz and her colleagues (2011) that assessed the role of pedagogy in constraining spontaneous exploration, we test 4- and 5-year-old monolingual Hungarian-speaking children in two between-subject conditions. In one condition children observe a non-verbal but pedagogical demonstration by a native speaker on how to operate a novel object whereas in the other condition children observe the identical demonstration on the same object by a foreign language speaker. The target object we use has four non-visible functions as in the original study. Data collection is ongoing and will be completed by November 2023 (N = 30 per group). We hypothesize that while children will be equally likely to perform the demonstrated function in both conditions, the demonstration will limit spontaneous exploration in children only in the linguistic ingroup condition. This study aims to conceptually replicate the original study and to extend the interpretation of the findings by arguing that children's spontaneous restriction of their exploration may be a consequence of their strong motivation to rapidly acquire relevant cultural knowledge and behaviors.

PB-03 Explorative and exploitative actions across development: Effects of perceptual uncertainty and novelty

Penny Bounia-Mastrogianni, Richard Cooper, Denis Mareschal
Birkbeck College

Humans are known to assign value to the information they can gain from the world, similar to the one they assign to external rewards, and they curiously explore when they encounter uncertain or novel situations. Allegedly, their curious behaviour changes from infancy to adulthood, resulting in less broad exploration (Gopnik, 2017), while they might be differently influenced by uncertainty and novelty. This difference might also vary as a function of individual cognitive skills - especially executive functions (Chrysikou, Weber & Thompson-Schill, 2014). While the relationship between exploratory behavior and maturation has been studied before, we aimed to focus on the specific process of planning exploratory versus exploitative actions and investigate how these decisions unfold real-time. Furthermore, we aimed to examine how their parameters can be predicted by age and individual differences. In four experiments, 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 a rewarding goal (or immediate reward), to missing perceptual information or to novel unpredictable stimuli. 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, and standard executive functions tasks. Results across all experiments showed a greater preference for novel stimulation in children, while uncertainty influenced choices more in the older groups. Furthermore, mixed-effects analyses on movement parameters revealed differences in the geometrical parameters of children's hand kinematics, suggesting greater conflict between uncertainty and novelty in children.

Inhibition scores also correlated with children's ability to follow two simultaneous goals (external-informational) in the relevant experiment.

PB-04 The impact of story visualization and social context on children's creativity

Rebeka Szőke, Eszter Rohán, Veronika Konok
Eötvös Loránd University

Storytelling is essential in both learning and secure parent-child attachment providing a basis for creative abilities. New technology allows various forms of storytelling which can affect creativity and imagination differently. Digital stories and audiobooks can deprive storytelling of the social context by listening to a stranger's audio and not the caretaker's voice. Since cartoons contain several nonverbal multimodal features and readymade images (e.g., animations, sound effects) children's fantasy might be used less compared to traditional books. We investigated whether the social context of storytelling (parent reading/ stranger's voice) and the intensity of visualization (animations and pictures) of a story affect children's creativity and imagination in short-term, and whether engaging in different forms of storytelling associates with trait creativity in the long-term. We expected stories told by the audio and with more intense visualization to be linked to lower creativity and mental imaginary scores. We also expected an association between trait creativity and digital/traditional storytelling frequency. Participants were 6-7-year-old children (N=70) and their parents. Parents reported their child's digital media use, storytelling habits, and trait creativity. In an experiment, children's creativity was assessed (Alternative Uses Test, Figure Association Test, Test for Creative Thinking – Drawing Production, and the Mental Comparison Task) before and after watching/hearing a story on a tablet either read by the parent or heard from the original audio of the cartoon. Stories also varied on the level of visualization (full animation, pictures, no image).
Preliminary results (N=30) suggest that those children whose parents read stories from traditional books more often are reported to be more creative by the parent. In the experiment, children's creativity improved more in the social condition than in the asocial one. These results align with our hypotheses and may be verified and supplemented by additional findings of the final analysis.

PB-05 Modulation of saccade-rate in infants during their first year of life

Sheer Wolf, Yael Ben Shalom, Shlomit Yuval-Greenberg
Tel Aviv University

As predominantly visual creatures, human rely on visual exploration (fixations with intermittent saccades) to study their environment. This behavior undergoes a substantial development during the first year of life, as it shifts from being a disorganized sampling process to become an organized, top-down-controlled, one. Research on the development of visual exploration

focused mainly on its spatial, rather than temporal aspects: where rather than when the eyes move. In adults, it is known that visual stimulation leads to an inhibition of saccades, followed by a large rebound of saccade-rate before returning to baseline. The characteristics of this saccade-rate modulation are affected by top-down and bottom-up factors including rarity and familiarity. Here, we examine, for the first time, the developmental course of the temporal dynamics of saccade-rate. In one experiment, three groups of participants, 3, 6 and 12 months old (N=20 each), were presented with black-and-white checkerboards, shortly followed by a video of a face. Findings showed that saccade-rate was modulated in response to the checkerboard stimulus, in all three groups of infants. In contrast, saccade-rate was modulated by filmed faces only in infants 6-months-old and above. In a second experiment we presented 3 and 12-months-old participants (N=12 each group), with black-and-white drawings of meaningful and abstract objects. Findings showed a pronounced modulation of saccade-rate for both types of images in infants of both groups. An effect of object meaningfulness (higher rebound for meaningful vs. abstract objects) was found only for the older infants. We conclude that the temporal modulation of visual exploration is present in early infancy but only when stimuli are simple and of high contrast. Saccade-rate modulation reflects top-down recognition of semantic contents in 12-month-old, but not younger, infants. We suggest that studying saccade-rate modulation could promote our understanding of the development of perceptual and cognitive processes in infancy.

PB-06 Effects of personality and life context on twin children collaborative drawing dynamics

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Studies on twins have shown effects of genetic proximity on cooperation, namely that monozygotic twins (sharing 100% of their genes) cooperate more than dizygotic twins (who share around 50% of their genes). However other factors than genetic cooperation can explain these results. In this study, we explore cooperation in twins as a function of zygosity as well as other variables such as sex, age, relationship's dimensions (Closeness, Dependence, Rivalry, Conflict, Dominance), twin's habits (Same dressing, Same activities), parent's habits (Twin dressing, Twin activities) and schooling condition (Same classroom). The hypothesis is that not only zygosity but also psychological and behavioral factors can predict differences in cooperative behaviors. We tested 72 Brazilian twins aged between 6 and 14 years old, (Zygosity: MZ=38; Pairs' sex composition: Female=24, Mixed-sex=10) on a drawing task. More specifically, twins had to draw their house together using one paper sheet and 5 markers, in 5 minutes. We used non-parametric Fisher-Pitman permutation tests for our statistical analysis. Unlike expectations, we did not find any significant differences between zygosity in any of the drawing behaviors duration under study. However, regarding biological factors, we found that pairs of girls had higher durations of Codrawing than boys ($p=0.01$), and that older twins had higher Latency ones than younger ones ($r=0.27$;$p=0.04$). Regarding relationship's dimensions,

relatively more dominant ($p<0.001$) or conflictual ($p=0.04$) twins had higher Drawing durations than less dominant or conflictual ones. Also, pairs with relatively higher preferences for doing activities together had higher Codrawing durations than pairs with lower preferences ($p<0.001$). Our present results suggest that the nature of the cooperative differences found in the literature is more related to personality and relationship dynamics than genetic proximity.

PB-07 A more granular search for evidence for an infant altercentric bias

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As a follow-up on early work presented at BCCCD22, we employ a modified smurf task (Kóvacs et al., 2010) that affords more detailed predictions for the altercentric bias (Manea et al., 2023; Yeung et al., 2022; CG Wiesmann et al., 2022).
Usually, a group of infants is presented with one pair of conditions. For controls, an agent (A) sees the same last event as the participants (P), either a ball leaving the scene (P-A-) or ending up in the scene, behind the sole occluder (P+A+). A control is paired with an experimental condition where the agent sees only the next-to-last event (P-A+ or P+A-, the latter untested with infants so far), and the question is whether infants' expectations are contaminated by the agent's outdated information on the ball's location.
Ideally, all four conditions would be within-subjects This would allow us to test a more granular prediction for infants' expectancy violations: P+A+ > P-A+ > P+A- > P-A-. That is, we expect compounding effects when the agent sees the same actions (P+A+ & P-A-) as well as a congruent outcome more surprising than an incongruent one (P-A+ > P+A-).
Achieving a realistic sample size with four conditions requires maximising the valid data collected per participant. We built an infant eye-tracking system from the ground up that allows us to add pupillometry to looking time studies without altering the experimental layout. We are able to run a 'relive' of the session with different algorithm parameter values if the initial data are too noisy. We currently have data from 100% of the infants tested (n = 34) and we were able to run 12 trials per participant with most infants. We plan to present the new system, a preregistration strategy that obviates the need for piloting, and the study results at the conference.

PB-08 Development of Time Threshold and Emergent Process of Visual Consciousness with the Level of Task Processing

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The question of whether consciousness emerges in an ""all-or-nothing"" or "gradual" manner is one of the central topics in consciousness studies. The transition from unconscious to conscious

experience is called “the emergent process of consciousness.” In previous studies with adults, the objective discrimination performance and subjective awareness rates were more gradual for lower-order processing tasks (color task) than higher-order processing tasks (number task). This suggests that the emergent process of consciousness differs across levels of processing in adults. Yet, the developmental aspects of this process still need to be fully understood. In this study, we examined the development of time thresholds and emergent processes of objective discrimination and subjective awareness with levels of stimulus processing. Eighty-nine, ranging from 5 to 12 years old and adults, participated in two online discrimination tasks. These tasks involved color discrimination as lower-level processing and number magnitude discrimination as higher-level processing, with stimulus onset asynchronies (SOAs) varying from 16.7 to 266.7 ms. We measured objective discrimination accuracy and used a 4-scale Perceptual Awareness Scale (PAS) to assess subjective awareness. We fit the data to a four-parameter nonlinear function to estimate the center of the slope (threshold) and the range of the slope (gradualness) of the model. Our analysis revealed that the threshold for objective discrimination was significantly higher in 5-6-year-olds than in other age groups but not for subjective awareness. Moreover, the emergent processes of objective discrimination and subjective awareness did not differ significantly by age and level of task processing. Additionally, the objective discrimination accuracy in 5-6-year-olds was significantly smaller than in other age groups.

Our findings suggest that while the threshold for visual consciousness develops with age, the emergent process is adult-like from age 5. Additionally, these results indicate that the visual consciousness of 5-6-year-olds is more sensitive to disturbing stimuli.

PB-09 Self-Directed Learning: Spatial Navigation and Memory

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Over the past years, self-directed learning methods have gained increasing attention in educational research and practice. During self-directed tasks, learners are given the active control of information flow and timing - compared to passive tasks where learners can only absorb the information they are presented with. Previous work presents increasing evidence that active control leads to improved recognition memory from an early age, in image learning, word learning and in spatial navigation tasks. In particular, active navigation of a spatial environment leads to better memory as early as five years of age (see Ruggeri et al., 2019). A number of studies have shown that certain forms of spatial memory (e.g., memory for the distances between landmarks) are enhanced by active navigation of the environment (see Chrastil & Warren, 2012). This advantage has shown to be specific to task-relevant information. In this project, we investigate across two studies the emergence and developmental trajectory of this selective advantage of active spatial navigation. In a first experiment 107 children (3 to 10 years) were tested in a map game, where they were asked to find the shortest way for a monster to get

across town, while collecting his five monster friends on the way. We manipulated between subjects whether children could draw the way from scratch (active condition) or had to follow the way drawn by the previous child (yoked condition). Results suggest that children afterwards remembered the way more accurately in the active compared to the yoked condition, but we did not find differences between conditions in children's memory for other memory elements (e.g., names of the monster friends). We are currently running a within-subject replication of the first experiment in which we decided to also counterbalance all memory tasks. Data collection is ongoing and we already collected data from 47 participants.

PB-10 From Perceptual to Conceptual: The Development of Young Children's Information-Search Strategies

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Recent studies in active learning suggest that by age 3 children already master the computational foundations required to recognize and exploit the statistical features of their learning environment (Ruggeri, 2022). However, it remains essential to ascertain to what extent children robustly employ adaptive information-search strategies in dynamic situations, which directly tap into their ability to monitor the changes in given tasks. The current study implemented a dynamic search task with minimal verbal and cognitive demands to capture the emergence of this ability. The strategies that can be used to solve this task are analogous to those used in the 20-questions game – hypothesis-scanning strategies that exclude one possibility at each step of the search, or constraint-seeking strategies that test multiple hypotheses simultaneously. Across four rounds, 3- to 7-year-olds were shown search spaces that differed in the likely distribution of the target location. Specifically, possible target locations were either clustered together or scattered across the search area. Based on previous work, we predicted that older children would use the optimal constraint-seeking strategy, formulating queries that evenly split the hypothesis space, regardless of the distribution of possible locations. In contrast, younger children would rely on perceptual heuristics, namely targeting a smaller search area for the spatially-scattered hypothesis space but a larger search area for the more clustered hypothesis space. Data collection will be completed by the end of September, but preliminary data (N = 17 out of 50 planned) are in line with predictions: Younger children tended to start with hypothesis-scanning strategies for more scattered search spaces and with constraint-seeking strategies for clustered ones. With age, children gradually abandoned these perceptual heuristics in favor of more efficient information-search strategies.

PB-11 The Impact of Audiovisual Exposure to Other-Race Faces on Face Processing in 9- to 12-Month-Olds

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Loyola University Chicago

This study aimed to understand how audiovisual exposure influences other-race face processing in 9- to 12-month-old infants. The other-race effect (ORE) is characterized by better processing and recognition of faces that belong to one's own race, compared to faces of other races. Additionally, audiovisual stimuli have been shown to elicit increased attention in infants. While the ORE has traditionally been studied using static stimuli, some studies indicated that audiovisual exposure to other-race faces may diminish the ORE, allowing infants to discriminate between faces of other races. We recruited 9- to 12-month-olds to participate in an online study via Lookit (N = 81). Participants were familiarized with two side-by-side videos of women reciting a children's story, where the soundtrack matched only one of the videos. Following familiarization, three visual-paired comparison (VPC) trials were presented: 1) the familiarized-synchronous face and the familiarized-asynchronous face; 2) the familiarized-synchronous face and a novel face; and 3) the familiarized-asynchronous face and a novel face. Looking was tested using one-sample t-tests. The results showed that during familiarization, participants looked significantly longer at the asynchronous face compared to the synchronous face. When the familiarized-asynchronous face was paired with a novel face during the VPCs, they looked significantly more at the asynchronous-familiar face. Although past studies found that own-race faces promote audiovisual integration, in the current study, infants showed increased attention to the asynchronous face compared to the synchronous face during familiarization. This indicates that audiovisual synchrony may impact infants' attention differently when they view own- versus other-race faces. Infants did not recognize the synchronous face, possibly because audiovisual synchrony directed attention away from modality-specific properties of the face. This shows that multimodal exposure to other-race faces may promote processing of other-race faces and reduce the ORE in naturalistic contexts, compared to visual-only stimuli frequently utilized in ORE research.

PB-12 Learning repetition-based regularities in speech: a NIRS study with 7-month-old infants

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Newborns and infants exhibit a robust capacity for learning rules from speech. At birth, they can encode repetition- and diversity-based regularities between adjacent syllables (e.g., ABB: ''mubaba" vs ABC: ''mubage", respectively; de la Cruz-Pavía & Gervain, 2021). By contrast, they fail in the encoding of non-adjacent repetitions (e.g., ABA: "bamuba") from diversity-based controls (ABC) (Gervain et al., 2008). While six-month-old infants also succeed in the adjacent repetitions encoding (de la Cruz-Pavía & Gervain, 2023), they have not been tested for non-adjacent repetitions so far.

Since non-adjacent dependencies play an important role in language, in this study we investigate if 7-month-old infants can discriminate non-adjacent repetitions from ABC controls using functional near-infrared spectroscopy (fNIRS).

We are testing 5-8-month-old infants in a simple block design paradigm, where sequences from a repetition-based ABA artificial grammar and from an unstructured ABC control grammar are presented. Both the ABA and the ABC artificial grammars are matched in all nonstructural properties: the same syllabic repertoire made of 20 CV syllables, the same phonologic characteristics, and a flat prosody. Infants' brain responses are recorded using fNIRS with a montage of 20 channels covering the frontal, temporal, and parietal regions, bilaterally. Data collection is ongoing. Preliminary results from 21 babies (10 females, mean age: 201.2 days) suggest that infants encode both non-adjacent repetitions and diversity-based structures as compared to baseline in bilateral temporal areas. Once the final sample is reached, comparisons between the two conditions will be run.

If confirmed, these results suggest that infants are able to encode non-adjacent repetitions as early as 7 months of age, laying the foundations for grammar learning.

PB-13 The side eye: processing of visual stimuli in utero

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Our knowledge of fetal visual perception is highly limited. Recent modelling has demonstrated that the prenatal environment has greater luminosity than previously thought (del Giudice, 2011), with visual experiences beginning before birth. Clear anatomical differences exist between the fetal and adult eyes. Noticeably, the central retina is structurally immature in the fetal period, with the peripheral retina relatively more developmentally advanced prior to birth (Hendrickson et al., 2012; Hendrickson & Drucker, 1992). Neonates more readily orient to stimuli initially presented to the temporal visual field (Lewis et al., 1978; Lewis & Maurer, 1992a, 1992b; Simion et al., 1998). The present study explores whether the human fetus will preferentially orient to light stimuli in their temporal visual field when contrasted with nasal presentations. We hypothesised that the fetus would be more responsive to stimuli presented to the temporal visual field. Participants include 51 singleton fetuses between 33 and 36 weeks gestation (M:239.4 days). 2D ultrasound was used to visualise the fetal lens and record fetal eye movements. A light stimulus (a 650nm dot diode) was presented to the fetus in two separate locations; the temporal and nasal visual fields. The stimulus was moved in a vertical orientation to the face of the fetus. Eye movements were recorded to measure fetal visual engagement with the stimulus. Fetuses demonstrated significantly more eye movements to stimuli in the temporal presentation (Median= 5) compared to stimuli in the nasal presentation (Median=2), Wilcoxon Signed-Ranks test, $Z=-2.34$, $p=0.02$, $r=-0.33$. These findings provide the first initial insights into the parameters of fetal visual processing. Notably, this encompasses spatial processing of visual stimuli. Investigating

prenatal vision establishes the initial origins and predispositions of visual perception. Mapping experimentally induced visual responses in utero will aid in our understanding of the developmental trajectory of vision across the lifespan.

PB-14 Can maternal touch modulate infants' attentional bias towards fearful facial expressions?

Elena Guida, Margaret Addabbo, Chiara Turati
University of Milano-Bicocca

Maternal touch is a nonverbal signal that can regulate the child's internal states when facing stressful situations. For example, touch can reduce children's alertness to socially threatening stimuli (e.g., angry faces) (Brummelman et al., 2019) and modulate visual attention to both happy and angry faces (Addabbo et al., 2021). To date, no study explored whether maternal touch could modulate infants' attentional bias towards adult fearful expressions, which develops by the second half of the first year. During the procedure, the infant was shown an overlap task - recorded with the eye-tracker – with emotional faces (happy, neutral, fearful) in the centre of the screen, followed by a peripheral target stimulus. Fourty-eight 7-month-old infants participated and were divided into a No-Touch group (N=24), in which mothers stand still next to the baby without touching him or her, and a Touch group (N=24), in which mothers placed their hand on the baby's leg. The repeated-measures Analysis of Variance (rmANOVAs) on disengagement times (DT) with Emotion (Fear, Happy, Neutral) as within-subjects factor and Group (Touch, No-Touch) as between-subjects factor revealed a significant principal effect of Emotion ($F(2, 92) = 4.40$; $p = .015$, $\eta p2 = .09$), confirming the fear bias. Also, a significant Emotion x Group interaction ($F(2, 92) = 3.34$; $p = .04$, $\eta p2 = .07$) showed an effect of maternal touch, which results in an increased infants' attention to faces expressing fear ($F (2, 92) = 3.06$; $p = .040$). Moreover, the frequency of Affective Touch detected during the free dyadic interaction that occurred right after was associated with longer DT from fearful faces ($r = 0.312$; $p = .042$). It is possible that, by signalling safety, maternal touch promotes infants' increased attention to faces that express fear, favouring prolonged exploration of the negative emotional stimulus.

PB-15 Investigating Strategies to Improve Young Children's Saving Behaviour

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Brock University

The ability to save resources for future use, or saving, emerges around the age of 3. However, children show poor saving skills during the preschool years (Metcalf & Atance, 2011). Researchers have examined several strategies to improve young children's saving; for example, preschoolers saved more when they budgeted their expenses (Kamawar et al., 2019) or when they were verbally reminded to save (Atance et al., 2017) but not when they took another person's perspective (Jerome et al., 2023).

The current study aimed to examine which strategies might be most successful in improving saving and how their effectiveness might change over the preschool years. Three- to 5-year-old Canadian children (N=254) participated in the study. The Saving Board Game (a behavioural measure) and the Children's Future-Thinking Questionnaire (a parent-report questionnaire; Mazachowsky & Mahy, 2020) were administered to measure saving. Children were randomly assigned to one of five strategy conditions in the Saving Board Game: Control, Budgeting (children budgeted their expenses before the game), Tracking (children counted their tokens at three points during the game), Psychological Distancing-Adult (children pretended to be a grown-up during the game), and Psychological Distancing-Child (children pretended to be a same-aged peer during the game). An ANCOVA with age, strategy, and the response option order (a covariate) showed a main effect of age ($F[2,238]=10.29$, $p<.001$, $\eta 2=.082$): Five-year-olds outperformed 3-year-olds in the Saving Board Game ($p<.001$). However, there was neither an effect of strategy nor an interaction between age and strategy. Parent-report saving was positively correlated with children's age ($r[230]=.25$, $p<.001$) and their Saving Board Game performance in the control condition only ($r[44]=.34$, $p=.021$). Children's saving increased with age but was unaffected by different strategies. These strategies were designed to ease executive demand (budgeting-planning, tracking-updating, psychological distance-inhibition). Children's saving might be related to other aspects of cognition or temperament.

PB-16 Friends before bosses? Testing how friendship, status, and dominance influence prosocial behavior among preschool peers

Johanna Wimmer, Anne Katerkamp, Lisa Horn
University of Vienna

Early life peer interactions are essential for the development of social understanding as well as the acquisition of social skills. Preschool is a particularly interesting social environment because, for many children, it is the first opportunity to socialize with a broad range of same-aged peers (Howes et al., 1988). This period is characterized by the formation of peer friendships and emerging prosocial tendencies (Afshordi & Liberman, 2021). At the same time, peer groups establish social hierarchies, in which some members are more popular (i.e., status) and/or have better access to resources (i.e., dominance) than others (Pellegrini et al., 2007). Yet, to date we have limited knowledge about preschoolers' ability to balance these two aspects of their social lives. Therefore, in the current study, we investigated preschoolers' interactions with familiar peers in a naturalistic group setting. Our aim was to test whether children's social status and dominance influence their prosocial tendencies and whether prosocial acts occur more often among friends. We tested 109 children, aged 3 to 7 years (M = 5.05 years, SD = 0.94 years), from five preschools in Vienna. We assessed friendship and social status with sociometric peer interviews. All groups participated in a series of games designed to elicit dominant and/or prosocial behavior (e.g., resource competition; helping). We could not confirm social status as a predictor for either prosocial or dominant behavior. Friendship, on the other hand, was a significant positive predictor

for sharing and helping. We found a moderate positive association between dominance and prosocial behavior, which was partly explained by an underlying positive association with age. Our results highlight the importance of peer friendships for the expression of prosocial behavior in preschool. That friendship, but not status or dominance, predicted prosocial behavior is of particular interest and suggests that friendship might "overrule" group hierarchies.

PB-17 Influences of early dyadic and triadic interactions on infants' heart rate responses

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Early family interactions are one of the strongest predictors of children's emotional development throughout the years (Favez et al., 2017; Hébert et al., 2021; Tissot et al., 2022). Most of the studies on infants' physiological regulation, as a specific indicator of emotion regulation abilities, have been conducted in parent-infant dyads (Morris et al., 2007; Rodrigues et al., 2021; Tronick & Beeghly, 2011). Yet, the social context of the child is more complex and includes triadic interactions involving both the mother and the father (Fivaz-Depeursinge & Corboz-Warnery, 1999). To date, no study has been conducted to examine how triadic vs dyadic interactions affect physiological arousal regulation at a family level. Here, using an observational paradigm (Lausanne Trilogue Play), we investigated how the family context modulates heart rate (beats per minute, bpm) in a cohort of 4-5-month-old infants and their parents.

Results show that the interactive context (triadic and dyadic scenes) modulates the Heart Rate (HR) response. The child displays higher arousal activation (bpm) in the triadic exchange vs. the dyadic exchange ($F(1, 4)=164.04$; $p<.01$). Conversely, both mothers ($F(1, 4)=944.06$; $p<.01$) and fathers ($F(1, 4)=428.83$; $p<.01$) reduce physiological activation during triadic interactions compared to dyadic interactions. Thus, during the parental interaction the child's heart rate further increases, while parents' heart activation decreases.

For the infant, this pattern of activation may reflect a greater self-regulatory effort related to the increased stimulation in triadic interactions and the lack of external regulation in the parental exchange. For parents, the presence of the adult partner seems to reduce physiological activation. Results suggest that early triadic interactions and dyadic exchanges specifically shape physiological arousal responses.

PB-18 Verbs are sometimes redundant: Korean-speaking children's comprehension of transitive construction in Korean

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While verb is claimed to be crucial in identifying event representations and argument structures, some studies show a reduced role of verb—and an enhanced role of other elements (e.g., case-marking)—in language activities. This study investigates how verb and case-marking contribute to children's comprehension of transitives in Korean, an understudied language for this topic. 30 three-and-four-year-olds (M_{month}=49,SD_{month}=6), 23 five-and-six-year-olds (M_{month}=71,SD_{month}=7), and 20 adult-controls joined two picture selection experiments (Exp1: 6.items*2.conditions; Exp2: 6.items*3. conditions) using one argument transitive sentences. In Exp2, a pictorial context was introduced where the speaker was eating food; yum-yum sounds obscured verbs or case markers of the stimuli. Reaction time—the duration from the end of stimulus presentation to pressing a button for picture selection—was also collected as a measure of processing cost per stimulus.
The children's choices were affected more by the presence of case-marking than by the presence of verb, indicating the primary role of case-marking for interpreting this construction for Korean-speaking children. Three-and-four-year-olds relied more on the presence of verb than five-and-six-year-olds, pointing to age effects on children's utilisation of the verb cue during comprehension. There was no substantial by-condition difference in reaction times within each group, implying the presence/absence of verb may not incur particular challenges to children's picture selection behaviour (≠ their interpretation of this construction). Together, our findings suggest that verb may not always serve as an obligatory/faithful cue for Korean-speaking children's comprehension of a transitive construction.

PB-19 Find Sound: A game-based intervention to improve children's reading skills

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Learning to read is a fundamental process that children benefit from mastering early on in their education. However, classroom instruction is not always enough to support children's early reading acquisition, highlighting the necessity for developing effective interventions that provide additional support to young readers. The present study involved the development and evaluation of a novel reading intervention, called Find Sound, which aimed to improve children's phonological awareness and general reading abilities. With a sample of n=64 children ages 5 to 6.5 years, we tested the effectiveness of Find Sound against Find Shape, a geometry game with a similar structure that served as an active control condition. Children participated in online Zoom sessions before and after engaging in gameplay with their parent/caregiver for two-to-three weeks. In both sessions, participants received assessments measuring their reading and geometry skills, from which composite scores were calculated. Analyses of reading and geometry composite scores from the pre- and post-test

sessions revealed that children who played Find Sound did not show significant improvements in their reading skills compared to children who played Find Shape. Furthermore, participants who played Find Shape did not significantly improve in their geometry composite scores but demonstrated significant improvements on one of the geometry subtests, compared to those who played Find Sound. The results were trending in the expected direction indicating that children demonstrated greater improvements on their composite and near-transfer scores for the domain of the intervention they engaged with (reading or geometry) relative to their counterparts in the other condition. This research evaluates the efficacy of two distinct, home-based educational interventions that target foundational language and spatial skills of the elementary school curriculum, with the aim of improving important school-relevant skills in the short term for kindergarten-aged students and the hope of fostering subsequent learning in school.

PB-20 Children's meta-perceptions about out-groups and their association with intergroup attitudes

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Intergroup meta-perceptions (or meta-stereotypes) are one's beliefs regarding the views the out-group holds about his/her in-group (Vorauer et al.,1998). Depending on their valence, these meta-perceptions may affect people attitudes towards the out-group positively or negatively (Finchilescu, 2010; Vezzali, 2017). To date, intergroup meta-perceptions and their effects have not been studied among young children.

This study examined the development of Israeli-Jewish children's meta-perceptions about Arabs (a ""conflict"" out-group) and Scots (a ""neutral"" out-group) and their association with intergroup attitudes. 108 children (40 kindergarteners, Mage=5.18, 35 2nd graders, Mage=7.64, and 33 5th graders, Mage=10.73; 46% female) were asked open-ended questions about meta-perceptions toward these out-groups (e.g., ""What do you think Arabs think about Jews?""). They were also asked forced-choice questions on their meta-stereotypes towards the out-groups (e.g., ""Do you think Scots think that Jews are good?""). Finally, children's intergroup attitudes were assessed (willingness to contact, physical proximity, feelings towards meeting an out-group member). Children's meta-perceptions were classified to four categories: meta-prejudice (feelings that out-group has towards in-group), meta-stereotypes (traits that out-group attributes to in-group), meta-perceptions regarding relationship between the groups, and meta-perceptions regarding the country. Then, the meta-perceptions were classified according to their valence: positive/negative/neutral/complex. Results indicated that already at a young age of five, children expressed meta-perceptions towards out-groups, and with age, children expressed more meta-perceptions. Also, children in all ages had more negative meta-stereotypes towards Arabs than towards Scots. Moreover, meta-stereotypes towards the out-groups were correlated with willingness to contact them and feelings towards meeting them. Meaning, the more children had negative meta-stereotypes the less they felt positive feelings

towards meeting the out-groups and the less they were willing to contact them. This study reveals that negative meta-perceptions about out-groups are associated with negative attitudes towards them at an early age, raising the challenge to promote positive meta-perceptions between groups.

PB-21 How Children Understand Infinity and Envision Younger Children's Comprehension of Infinity

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Previous research focuses on children's perception of numerical infinity (Chu et al., 2020). However, conceptualizing infinity through an object by defining a repeated process (procedural infinity) may be effective to investigate children's understanding of different infinity types such as basic infinity or infinitesimal (infinite series approaching zero) at an early age. Additionally, children's expectations of younger children's perception on numeric and procedural infinity may highlight the relation between learning the mechanism of the repeated process and infinity comprehension. The present study first examines children's understanding of infinity through numerical and procedural infinity (story about an object's theoretical continuum where physical constraints don't apply). Through the follow-up questions, the study secondly investigates children's perceptions of two types of infinity (infinity and infinitesimals) and thirdly what they expect younger children to know about infinity. The study's participants are 30 children aged 6-7 who answer questions about different types of infinity through numeric and procedural tasks and who are asked to predict younger children's perspectives about the same questions. The 6-7-year-old children are expected to comprehend numerical infinity and to expect younger children to not comprehend the concept. The children are also expected to not comprehend numerical infinitesimals and to not expect younger children to understand the concept either. However, for the procedural infinity task, the children are expected to both comprehend infinity and infinitesimals, as well as to also imagine younger children to be able to comprehend these concepts. These findings will help illuminate the question of how children grasp infinity. Their understanding hinges on knowing the underlying principles of infinity. By teaching these principles early by telling a story of an object division process rather than a numeric continuum, we believe children will be able to recognize the concept of infinity sooner and to anticipate the same from their younger peers.

PB-22 Parent-Administered Screen Time Intervention (PASTI) in Toddlers: A Randomised Control Trial

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Toddler screen time is increasing and has been associated with changes in sleep and attention. Understanding the causal impact of screen time is of the highest importance. Here, we present a pilot and feasibility randomised controlled trial (RCT) of a 7-week Parent-Administered Screen Time Intervention (PASTI) in toddlers aged 17–31 months old who have screen time in the hour before bed. PASTI materials were cocreated with parents and early years partners. PASTI will be assessed via a researcher-blind RCT with three parallel arms; 1) no-intervention arm: families continue as usual and do not know that screen time is the focus of the trial; 2) PASTI arm: caregivers remove all screen time from their child in the hour before bed and instead use age-appropriate activities from a Bedtime Box; 3) Bedtime Box arm: caregivers receive the same materials as the PASTI arm, but without any guidance on removing screen time. To assess efficacy, measures of sleep (e.g., total night-time sleep) are captured using Actigraphy and parent-reported sleep diaries. Measures of attention are captured using experimental eye tracking tasks. Measures of screen use are captured using parent-reported questionnaires. By comparing the PASTI arm to the Bedtime Box arm we aim to isolate the causal impact of screen time on toddler sleep and attention. A socioeconomically (SES) diverse sample of 105 families were recruited across the three arms using randomisation minimisation of age, gender and SES. 104 families completed our trial. Preliminary feasibility outcomes indicate successful participant recruitment and randomisation rates, as well as high retention to follow up (99%). Further feasibility outcomes will be presented including intervention adherence. We will present effect size estimates for efficacy outcomes of PASTI which will provide the first direct evidence of a causal impact of screen time before bed on toddler sleep and attention.

PB-23 Patterns of Maternal Infant Directed Speech related to Infants' Sex, Temperament and Language Skills

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Some of the widely accepted features of maternal infant-directed speech (IDS) are increased speech quantity, shorter utterance length, and lexical simplification and frequent repetitions. These features of maternal IDS can be interpreted as an instinctive strategic redundancy that could support infants' language comprehension and acquisition. However, the lexical

and syntactic complexity of IDS differ from adult-directed speech (ADS) only in a subset of mothers, and they show great variation and different reduction strategies in their IDS. Our study aimed to assess the link between the infants' sex, vocabulary level, temperament and different use of maternal IDS. Our research involved 102 mother-child dyads (50 girls) to collect narrative IDS samples. Mothers narrated stories semi-spontaneously to their first-born 18-month-old children based on the same picture book. Vocabulary development was measured by the MacArthur-Bates CDI, while the infant's temperament was assessed by the Very Short Form of Early Childhood Behavior Questionnaire (scales: Surgency, Negative Affectivity, Effortful Control). High inter-individual variation was found in speech quantity, syntactic and lexical complexity in maternal IDS narrative samples. Our data revealed that mothers of male infants narrate the same story with more words and utterances and less lexical diversity, thus, with higher speech quantity and more repetitions compared to mothers of female infants. Contrary to our expectations, there was no significant correlation between infants' vocabulary levels and maternal IDS features in either sex group. Lexical diversity patterns of maternal IDS are correlated with infants' Surgency level only in narratives told to male infants and with Negative Affectivity regardless of sex. In conclusion, maternal IDS characteristics in storytelling are found to be related to children's temperament as well as their sex but not their vocabulary skills at 18 months.

PB-24 Development of Distribution Behavior: 5 to 8 Year Olds Do Not Consider the Recipient's Consumption History, While Adults Do

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This study examined resource allocation, a fundamental cooperative behavior in humans. Distribution practices often adhere to specific norms, with fairness and equality being essential aspects. However, the interpretation of fairness can vary, especially when the recipient already possesses resources, sparking ongoing debates in contemporary society. Hayashi's 2019 research explored how individuals assess distribution behaviors, finding that both adults and children prefer the Equal-Outcome principle, considering recipients' existing resources, over the Equal-Allocation principle, which promotes equal distribution of new resources. This preference raises next questions about handling resources consumed before the distribution. We employed three-party distribution scenarios where participants distributed resources based on presented stories. It enabled distinguishing Equal-Outcome (Appearance) distribution, considering current recipient-owned resources, from Equal-Outcome (Process) distribution, which accounts for previously consumed resources.
Participants included 48 adults and 37 children aged 5-8. They observed an animated sequence where three characters visited three houses, distributing six candies with varying ratios. Then, participants distributed six candies among the characters, assuming the fourth house was their own. Experiments 1-1 and 2-1 aimed to replicate the Equal-Outcome principle in three-party distribution,

while Experiments 1-2 and 2-2 added scenarios where characters consumed candies during visits. Results revealed a preference for specific distribution patterns (EA/EO(A)/EO(P)) among participants, regardless of 28 possible combinations. Both adults and children displayed a bias toward EO distribution in Experiments 1-1 and 2-1. In Experiment 2-1, adults exhibited a mix of EO(A) and EO(P) distribution. In contrast, children primarily adhered to EO(A) distribution in Experiment 2-2, with no EO(P) instances. Interviews confirmed the robust memory of 5-8-year-olds, excluding memory fragility as a factor. To observe EO(P) distribution in adults, cultural and social norm learning may be required post-age 8, at least within contemporary Japanese society. Future research will focus on emergence timelines, cultural factors, and individual characteristics influencing distribution preferences.

PB-25 Imaginary Companions and Fantasy Orientation: A Longitudinal Examination in Early Childhood

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During early childhood, creating and interacting with imaginary companions (ICs) is a common form of pretend play, which allow a more direct opportunity to practice navigating social interactions without facing negative consequences from a real-life partner (Gleason, 2017; Taylor, 1999). Current literature has extensive work on cross-sectional research for ICs, but there is relatively less longitudinal IC research in the field.

This longitudinal study aimed to investigate the development of children's ICs and its relation to children's fantasy orientation. We interviewed 141 participants (84 female) (Mage = 4.53, SD = .64) at Time 1 about children's ICs and fantasy orientation, and 74 participants (~52%) indicated having an IC. These same participants (Mage = 5.32, SD = .88) were interviewed again at Time 2, and 59 of them (~42%) indicated having an IC. If children indicated having an IC, we asked further questions regarding the IC's name, form (i.e., Invisible or Personified Object), gender, age, physical appearance, and residence (Taylor et al., 1993). Fantasy orientation was examined by asking children whether they like to pretend, talk to themselves in bed before going to sleep, like to make up songs or plays, and sing songs or act out plays for family and friends (Richert & Smith, 2011). A Wilcoxon Signed-Rank Test revealed that Time 1 overall fantasy orientation scores were significantly higher than Time 2, $Z = -2.58$, $p = .01$. Furthermore, in Time 1, a Mann-Whitney U test revealed that children with ICs were overall more fantasy oriented than children without them, $U = 1144.50$, $p < .001$, and the same trend held true in Time 2, $U = 1224.00$, $p < .001$. These findings suggest that engagement with imagination in early childhood, especially with imaginary companions and fantasy orientation, provides a unique avenue to examine children's cognitive development.

PB-26 Motivated Information Search: Investigating the impact of context on efficiency across age groups

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Previous research investigating the developmental trajectory of information-search strategies found that efficiency begins to improve dramatically at age 3. This work also shows that children as young as 2 are ecological active learners, meaning they are able to tailor their search strategies to their environments to maximize information gain. In this project, we investigate across two studies how a social narrative can impact the efficiency of children (6- to 14-year-olds), adolescents (15- to 17-year-olds), and adults in a 20-Questions game. Participants are told they are competing in a sporting event against a rival team. When the championship trophy goes missing, the participant's team is either winning or losing. Participants are then tasked with playing a 20-Questions game to try to find the thief, and told that if the trophy is not found the competition will be canceled. We hypothesize that participants in the winning condition will be motivated to search efficiently, while conflicting motivations will cause those in the losing condition to search inefficiently. This is indeed what we find with adolescents and adults (n=177). Preliminary data from the children's sample (n=98, planned=170) suggests an even stronger difference between conditions. Overall, our findings suggest that social contexts play a strong role in modulating the efficiency of information search across age groups, and should be taken into account when tracing the developmental trajectory of children's information search strategies in real-world as well as in lab settings.

PB-27 Visual attention development in infancy

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Eye-movements are a valuable source of information, next to responses and response times, for inferring cognitive states and processes. Infant research depends on eye-movements to a large extent as other behavioral response modalities are hard to use in this population. Eye-movement data comes with many challenges, many basic properties are not well-known or understood. Optimal methods for defining fixations and saccades are still under much discussion. Free viewing presents a good way to study infant visual attention and provides robust developmental trends for a number of phenomena. We will present several studies that use free-viewing to study i) general biases such as horizontal and central bias, ii) the shift from saliency-based to object-based viewing, and iii) the relationship with individual differences variables (van Renswoude et al 2016, 2019a, 2019b, 2020). These results form an interesting target for computational modeling, for which we propose an information accumulation model (Kucharsky et al 2021). Finally, we present recent developments in the model. Kucharský, Š., van Renswoude, D., Raijmakers, M., & Visser, I. (2021). WALD-EM: Wald accumulation for locations and durations of eye movements. Psychological Review, 128(4), 667

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PB-28 Cognitive Pragmatic Treatment for autistic adolescents in telepractice (@CPT): A Pilot Study

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Autism Spectrum Disorder (ASD) is a neurodevelopmental disorder characterized by difficulties in social communication1, including pragmatics2. Despite these difficulties, there is a paucity of trainings to improve pragmatics in ASD3, and even less is available for telepractice use. We examined the effectiveness of Cognitive Pragmatic Treatment adapted for adolescents4 and innovatively delivered via telepractice (@CPT). @CPT is a 15-sessions group program for pragmatic ability comprehensively focusing on several communicative aspects, e.g., language, gestures, paralinguistic cues. Nine autistic adolescents (mean age=14.88±1.96, education=9.55±2.0, IQ=95.11±17.87) participated in @CPT, and seven matched autistic adolescents (controls), attended with the same frequency Treatment-As-Usual, and matched @CTP group for age (t=.27; p=.78), education (t=.63; p=.53) and IQ (t=1.08; p=.29).
Before and after training both groups were assessed on (a) pragmatics, (b) cognitive and Theory of Mind (ToM)5 abilities, as follows:
(a) Equivalent forms of Assessment Battery for Communication (ABaCo6-7), a validated tool assessing several pragmatic phenomena and expressive means.
(b Neuropsychological Evaluation Battery8, Strange Stories9 and Reading the Mind in the Eyes10 tasks.
We expect to detect in the @CPT group, but not in the control group, a specific improvement in the communicative-pragmatic ability, the program's target, and not in other cognitive/ToM skills. As expected, ABaCo total score (Wilcoxon's signed-rank test: z=2.54; p=.01), comprehension (z=2.07; p=.03), and production scales (z=2.19; p=.02) improved after-training in @CTP group but not in Treatment-As-Usual group (ABaCo total score: z=.16; p=.86; comprehension: z=1.18; p=.23; production: z=.33; p=.73). As expected, @CPT did not lead to cognitive/ToM improvement post-training (.23<z<2.22; .02<p<.81), with the exception of Strange Stories (z=2.19; p=.02) and Selective attention task (z=2.20; p=.02). Similarly,

no cognitive/ToM improvement was detected after Treatment-As-Usual (.00<z<1.47; .141<p< 1.00). This encouraging preliminary results suggest the potential of pragmatic interventions for autistic adolescents in telepractice and specifically show the effectiveness of the @CPT on pragmatic ability.

PB-29 Inner conflicts: How children navigate ultra-intensional contexts

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University of Göttingen

In our daily lives, we often face inner conflicts, like choosing between indulging in pizza or opting for a healthy salad. These dilemmas are termed ultra-intensional contexts (Bermudez, 2020, 2022), where the substitution of coreferential expressions are invalid, even though the different descriptions are known, leading to "quasi-cyclical preferences". For example, you might prefer salad over the pizza for its healthiness but crave pizza for its deliciousness. The question arises: How and when do children grasp these ultra-intensional contexts, and what underpins this cognitive ability? Previous studies have explored children's understanding of conflicting desires from a third-person perspective, revealing varying developmental onsets (e.g., 5 years in Rostad & Pexman, 2015 to 11 years in Bennett & Galpert, 1993). However, examining first-person understanding has been somewhat indirect, often relying on delay-of-gratification studies (e.g., Mischel & Ebbesen, 1970). Our study aims to address these limitations using a novel two-dimensional sorting task based on color and shape. We assess children's reaction times, signs of conflict comprehension (e.g., social referencing, game refusal) and their verbal explanations for sorting decisions. We explore both children's ability to recognize their own ultra-intensional conflicts (first person) and their capacity to identify such conflicts in others (third person). To investigate the nature of this ability, we also investigate correlations between meta-representational skills (measured through a change-of-location false-belief task) and children's recognition of intra-personal conflicts. Our preregistered study includes N=64 children (N=54 tested) aged 3 to 6 years (https://osf.io/ng24y/?view_only=b5660248e32147068c15b7a40388a876).

Preliminary findings suggest that around the beginning of their fourth year, children begin to recognize intra-personal conflicts. This recognition is evident through differing reaction times between conflict and non-conflict trials, along with other subtle indicators such as social referencing. However, the ability to verbally articulate these experienced conflicts seems to develop later. Possible links to metarepresentational skills will be discussed.

PB-30 Developmental model of spatial construction: shared and specific cognitive predictors of drawing and block design

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University of Campania Luigi Vanvitelli

Recent studies investigating the cognitive predictors of spatial construction in typically developing children demonstrated the main role of the ability to identify a figure within a complex spatial configuration (figure disembedding). This skill is equally involved in bi-dimensional (as drawing) and three-dimensional (as block design) spatial construction tasks. However, it has not yet been clarified whether other skills classically related to spatial construction, such as verbal skills, executive functions, mental rotation and visual-motor coordination, may contribute differently depending on the type of task. Here, we used the path analysis to test the direct and indirect (mediated) effects of executive functions (verbal and spatial working memory, visual attention and inhibition), language and verbal abilities (naming and vocabulary), figure disembedding and mental rotation, and visual-motor coordination, as well as of demographics (sex, age and socio-economic status), on two classical bi-dimensional (Rey-Osterrieth Complex Figure; ROCF) and three-dimensional (Block design; BD) spatial construction tasks. We recruited a sample of 195 typically developing children (age range: 7–11 years). Results showed that the ROCF score was directly related with visual attention, inhibition, figure disembedding and visual-motor coordination, whereas it was indirectly related with sex, age, socio-economic status, forward and backward spatial working memory, inhibition and figure disembedding. Instead, the Block Design (BD) score was directly related with sex, backward spatial working memory, verbal knowledge, figure disembedding, mental rotation and visual-motor coordination, and indirectly related with sex, age, socio-economic status, forward verbal working memory, forward and backward spatial working memory, visual attention, inhibition and verbal knowledge. These findings contribute to define a comprehensive developmental model of cognitive predictors of spatial construction, differentiating between skills involved in the construction process regardless of the type of task and abilities that are specifically activated in case the task requires to reproduce a bi- or a three-dimensional model.

PB-31 Infants' motor skills, cognitive functions and need understanding in the development of early helping behavior

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Infants start to help early after their first birthday, for example by handing over an object that is out of reach to another person. Throughout their second year of life, infants reliably help another person in need. The past 15 years of research have shown that several developmental processes are involved in the development of this critical prosocial attainment. Yet, the early

developmental trajectory of prosocial behavior, in particularly the critical determinants that precede the early ontogeny of helping behavior in the first year are not well understood. Here, in a longitudinal study, we investigated critical developmental processes during the first year of life that may contribute to the ontogeny of helping behavior in the second year. Specifically, at the age of 6 and 12 months, we assessed infants' motor and cognitive development using the Bayley Scales of Infant Development. At 16 months, we assessed their helping behavior in three instrumental out-of-reach tasks along with their motor abilities and social interaction skills. In addition, infants' prosocial understanding is assessed using an eye-tracking paradigm to test their understanding of other's needs, based on their anticipatory gaze behavior and looking time towards expected and unexpected outcomes.

First analyses revealed that children understand others' needs at the age of 16 months. Further analyses are underway.

We present our results with regard to a predictive relationship between motor development and cognitive functioning in the first year of life, namely at 6 and 12 months of age and subsequent helping behavior at 16 months of age, in an anticipated sample size of N=65. Furthermore, we aim to investigate whether this relationship is mediated by infants' prosocial understanding, motor abilities and social interaction skills at 16 months of age.

PB-32 One and the same: Does children's understanding of identity statements emerge with their false belief reasoning?

Jana Rechenburg, Hannes Rakoczy
University of Göttingen

When do children understand identity statements, and how does this ability relate to other developmental milestones, such as theory of mind? Mental files theory postulates that objects are represented in the mind by mental files, which can be linked vertically or horizontally to indicate their sameness of referent (Perner et al., 2015). Linking mental files is thus key to master both identity statements (horizontal linking) and the false belief task (vertical linking). This account therefore predicts that successful performance on these tasks emerges around the same time (Doherty & Perner, 2020; Perner & Leahy, 2016). Existing evidence corroborates this prediction (Perner et al., 2011). However, the tasks used in previous studies may have posed similar linguistic and executive performance demands. Co-emergence and correlation between these tasks may thus simply reflect shared performance factors. A different line of research on object identification and individuation from infancy on raises the possibility that children may be able to make non-verbal identity judgments much earlier in development (e.g., Xu & Carey, 1996). Inspired by previous work on numerical identity understanding in infancy (Xu & Carey, 1996), we developed a simplified identity task: children saw how object A (e.g., a rattle) was put behind an occluder. Then object B (e.g., a pen) was taken out from behind the occluder and put back. In the experimental condition (but not in a control condition), children then learned that A was also B, and were asked how many objects were behind the occluder.

In two preregistered studies (https://aspredicted.org/t8i37.pdf; https://aspredicted.org/mg63g.pdf, in data collection, total N = 60, age: 3-4 years) we compared children's performance on the identity task with their false belief reasoning (Wimmer & Perner, 1983). The results will be discussed with regard to children's developing understanding of identity statements as well as implications for mental files theory.

PB-33 Curiosity-driven exploration and autistic traits in typically-developing children

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Donders Institute for Brain, Cognition and Behavior, Radboud University

Curiosity-driven exploration guides our choices on what to explore based on an intrinsic drive to learn rather than on extrinsic rewards. Typically-developing (TD) children and adults explore different environments guided by the learning opportunities they offer (Poli et al., 2022, 2023). However, how curiosity-driven exploration relates to different personality traits, such as autistic traits, remains largely unexplored. Restricted, repetitive behaviors (RRBs) and Intolerance to Uncertainty (IU) are behaviors observed in Autism Spectrum Disorder (ASD) but also present in TD children (Harrop et al., 2013) that might impact exploration strategies. This study will elucidate how the exploration strategies of 6- to 8-year-old TD children are affected by autistic traits. We created a touchscreen task in which children can explore different environments (i.e., characters) that display different probabilistic motion patterns (Figure 1). Children can change character at any moment, which offers a way to quantify their exploration choices. A reinforcement-learning model will capture the extent to which children learn the patterns. This design allows us to relate trial-by-trial estimates of prediction error (PE) (i.e., mismatch between predicted and actual location of the character) and learning progress (LP) (i.e., reduction of PE over trials) to exploration choices. By collecting parental reports of autistic traits, we can test how different exploration strategies relate to RRBs and IU. We hypothesize that LP might guide the exploration of children with higher scores of autistic traits differently than children with lower scores. Autistic traits might relate to prolonged engagement in environments even as LP decreases. Preliminary data (N=17 shows that children's exploration is guided by LP, indicating that children remained engaged in environments depending on the extent to which they were making learning progress. We will have additional data by the end of November to be able to present analyses regarding the interaction with autistic traits scores.

PB-34 Children's judgments of others' reasons for not fulfilling their obligations: A cross-cultural online study

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Children understand obligations in the context of joint commitments by 3 years of age. Besides the specific obligations present in commitments, there are also more general, agent-neutral kinds of obligations, like the obligation to help. When both types of obligations are not fulfilled, the offenders might provide reasons to justify themselves, and the quality of these reasons will be judged by the offended party. In this cross-cultural study of Chinese and UK children, we investigate 5-year-olds' judgment of two individuals who did not fulfil their obligations based on the reasons the individuals gave for this to evaluate children's understanding of the normative force obligations in different contexts. Participants will be presented with two stories (one involving joint commitments and one involving helping) in which two individuals failed to fulfil their obligation and then gave their (good vs. poor) reasons for doing this. In different versions of the stories, the obligation will be stronger vs. weaker, or there will be minimal obligation. Children will then be asked about their attitudes toward these two individuals through forced choice and rating questions about liking, trust, blame and punishment, and will also be asked to provide justifications for their responses. Testing will take place in a video call with a live experimenter. We predict that: 1. children from both cultures will prefer the good-reason provider more and provide stronger justifications in conditions in both stories in which the obligation is stronger; 2. Chinese children will prefer the good-reason provider more and provide stronger justifications than British children in conditions in both stories in which the obligation is stronger. The data collection for Chinese children had completed, and the data collection for UK children is now undergoing.

PB-35 Talking Faces in Infant Language Learning: Mind the Gap between Screen-Based Settings and Real-Life Communicative Interactions

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Previous research suggests that perceiving the dynamic talking faces of interlocutors audio-visually is crucial for infants' early language development. Indeed, attention to talking faces (i.e., to a speaker's eyes and mouth) is proposed to be a powerful strategy that infants use to learn their native(s) language(s). However, it is worth noting that most of the evidence to support this claim comes from studies using well-controlled, screen-based laboratory approaches. In this talk, based on our review paper (Birulés et al., 2023), we review and contrast the evidence from such screen-based studies with another line of research, exploring how infants acquire vocabulary and deploy their visual attention during naturalistic interactions. We highlight and discuss the differences in infants' attention to faces that emerge from such comparison. Then, we examine the influence of three factors

(i.e., social contingency, speaker characteristics, and task-dependencies) that to our knowledge have been understudied so far and may help explain differences between screen-based and real-life learning strategies. Last, we propose some ideas for future research with the aim of reducing such knowledge gap and reaching a more comprehensive understanding of the various ways that infants do effectively rely upon the audiovisual information of talking faces for learning their native(s) language(s) in their real-life environment.

PB-36 Effect of Family SES on Explicit and Implicit Theories of Mind in Preschool and School-Aged Children

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Theories of mind (ToM) allow us to perceive ourselves and others as psychological beings with sometimes divergent beliefs, desires, intentions, and emotions. ToM develop at different rates when they are the result of explicit or implicit processes. Explicit ToM, relying on conscious and deliberate processes, develop around the age of 4 or 5, as suggested by the performance in the false belief tasks. Implicit ToM, which allow us to spontaneously take into account the mental states of people in our environment, develop much earlier, around 15 months of age. While language and executive functions support the development of explicit ToM, their role in the development of implicit ToM remains largely debated. Children's socio-economical background (i.e., family SES) also has an effect on performance in explicit ToM tasks, effect that could be mediated by the effect of family SES on children's language and executive functions. To date, no study has investigated whether the family SES has an effect on implicit ToM performance. Thus, the aims of the present study were twofold: (a) to assess the effect of family SES on explicit (explicit false beliefs) and implicit (implicit false beliefs) ToM performance in preschool and school-aged children, and (b) to determine whether this effect is mediated by the effect of family SES on language (vocabulary, syntax, learning new words) and executive function (inhibition and flexibility). To do so, we collected data from 479 children aged 3 to 7. We found that family SES was related to explicit ToM, but not to implicit ToM. Furthermore, the relationship between family SES and explicit ToM was mediated by language and executive function, when controlling for age. These findings suggest that language and executive performance underlie the impact of family SES on explicit ToM.

PB-37 Does implicit mentalising involve the representation of others' mental state content? Examining domain-specificity with an adapted Joint Simon task: A Registered Report

Malcolm Ka Yu Wong, Marina Bazhydai, Jen Jessica Wang
Lancaster University

Implicit mentalising involves the automatic awareness others' perspectives. While crucial to successful social functioning and joint action, the domain specificity of implicit mentalising is debated. The Joint Simon task is often used to demonstrate implicit mentalising in the form of a Joint Simon Effect (JSE), in which a spatial compatibility effect is elicited more strongly in a Joint Simon versus an Individual go/no-go task. The JSE has been proposed to stem from spontaneous action co-representation of a social partner's frame-of-reference, which creates a spatial overlap between stimulus-response location in the Joint (but not Individual) task. However, evidence also shows that any sufficiently salient entity (not necessarily social) can induce the JSE. In the present registered report, we will investigate the content of co-representation by employing a novel variant of the Joint Simon task, where typical geometric stimuli will be replaced with two coloured sets of distinct animal silhouettes. Each set will be assigned to either the participant themselves or their partner (self-/partner-assigned stimuli; or self-/not-assigned stimuli in the Individual task). Critically, a surprise image recognition task will be appended to the Simon task. This task will identify any partner-driven effects in incidental memory exclusive to the Joint task-sharing condition, versus the individually conducted condition. If results indicate that participants in the Joint task recognise partner-assigned stimuli significantly better than participants in the Individual task recognise not-assigned stimuli, this suggests that participants form a representation of the content from their partner's perspective during the shared task. Such a result implies that socially-specific processes are involved, hence provides support for the domain-specific account of implicit mentalising. Alternatively, a robust absence of this effect (supported by Bayesian statistics) would uphold the notion that domain-general processes underlie the JSE. Furthermore, the effect of interpersonal closeness on the JSE and recognition accuracy will be investigated.

PB-38 The development of children's storytelling in early childhood: the role of theory of mind and executive functions

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The goal of our research was to examine the relationships between children's storytelling, theory of mind and executive functions in early childhood. Specifically, we were interested in the role that the theory of mind and executive functions play in this development. The study was designed as a combination of cross-sectional and longitudinal. We included two age groups of children who were studied twice, one year apart. In the first assessment, the first age group included 59 children with a mean age of 3;7 years, while the second age group included 58 children with a mean age of 5;6

years. To assess the children's storytelling, we used the Little Glove Storytelling Test (Marjanovič Umek et al., 2011). To assess the theory of mind, we used the Theory of Mind Task Battery (Hutchins et al., 2014). Finally, to assess executive functions, the Day-Night Test (Gerstadt et al., 1994) and the Dimensional Change Card Sort were used (Frye idr., 1995; Zelazo, 2006). The results show that all competencies assessed develop rapidly in early childhood and that their association is statistically significant. However, the statistical significance of each association depended on the age of the children and the construct in question. The children's theory of mind was significantly correlated primarily with the content structure of children's stories. In contrast, children's executive functions across different age groups correlated more strongly with the grammatical structure of their stories. Our results suggest that both theory of mind and executive functions play an important role in children's storytelling competence. However, they are also associated with slightly different aspects of storytelling.

PB-39 Parents' contingent responses promote infants' pointing: A training study

Katharina Kaletsch, Ulf Liszkowski
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The emergence of index-finger pointing is closely related to early interactional experiences (Salomo & Liszkowski, 2013; Choi & Rowe, 2021). To unravel this relation is of special interest since the onset and frequency of pointing predicts subsequent language development (Kirk et al., 2022; Lüke & Grimminger et al., 2017) and its' absence indicates language delay (Capone & McGregor, 2004; Lüke & Ritterfeld et al., 2017) or autism spectrum disorders (Watson et al., 2013). By identifying which form of interaction promotes the development of pointing, we pave the way to treat early communicative delays before they manifest linguistically. Research emphasizes the positive influence of parents' contingent responses (Ger et al., 2018; Miller & Lossia; 2013; Liszkowski et al., 2004) and contingent pointing (Liszkowski et al., 2012; Kishimoto, 2017) on infants' pointing frequency. To verify these relationships and to assess possibilities for early interventions, we conducted a training study with 55 parent-infant dyads of which 28 were assigned to the intervention group. Parental training included three steps: Creating daily situations of shared interest, verbally responding to infants' gestures and parents' own pointing in response to infants' gesture. We collected data at two time points with a previously established online adaption of the decorated room paradigm. Infants mean age at t1 was 12m14d (SD = 6.91). After one months of training infants' in the intervention group pointed significantly more (M = 2.54, SD = 2.47) than infants' in the control group (M = 1.38, SD = 1.32; t(41.61) = -2.15; p = .035). Dummy coded intervention status predicts infants' pointing frequency at t2 while controlling for possibly confounding variables ($\chi 2$ (4) = 18.78, p < .001). We conclude that parents' contingent responsiveness sustainably mediates pointing as a social activity and thus is the primary candidate for parent interventions addressing early communicative delays.

PB-40 18-month-old infants can update false-beliefs on the basis of verbal information in a referentially ambiguous communicative context

Júlia Baross, Katalin Oláh, Ildikó Király
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Despite understanding language, 23-month-old infants struggle to update their prior knowledge regarding object location based on verbal information communicated to them. We investigated if a social situation, requiring communicative mind-reading, could facilitate such updating mechanisms in 18-month-olds, where they were required to resolve a referentially ambiguous request. Infants witnessed an object-hiding event by a person who was later deprived of visual access to the relocation of the objects by a second person. Then, infants heard the second person informing the first one about the relocation. Infants understood the relevance of this communicative exchange and selected the appropriate object upon request. Our results demonstrate that infants updated their knowledge about the first person's initial false-belief of the object's location to a true-belief, solely based on verbal information, contrasting earlier findings about verbal update. Therefore, we provide further evidence of preverbal infants tracking pragmatic references in the context of social partners' mental states, that might also enable them to be more adept at updating their knowledge of someone else's knowledge about object location, as compared to updating their own, first-person representation.

PB-41 Do factive and non-factive states rely on different systems? Evidence from children's evaluation of others' mental state reports

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Central European University

Nuanced distinctions in mental state attribution can be made on the basis of verbal reports. Consider utterances such as "I know that I have two strawberries." vs. "I think that I have three strawberries." The first naturally allows for factive mentalization, while the second is compatible with non-factive mentalization (Phillips et al, 2021). While not much is known about how these two forms of mentalization differ from each other on a representational level, we propose to treat factive and non-factive mentalization as separate systems.

The current study uses verbal reports to explore this factive vs. non-factive distinction, asking whether there is a cost associated with switching between them. In a tablet-based study, 4-5-year-olds watched videos of two protagonists collecting strawberries. Each protagonist gave information about the number of strawberries they have using either factive (know, see) or non-factive verbs (think, believe). Children's task is to determine which protagonist has more berries (target animal) and we measure their reaction time (RT). In non-switch trials, both utterances use one class of verbs (both factive or both non-factive). In switch trials, the utterances use different classes of verbs (one factive and the other non-factive). If factivity is organized into two systems, we expect non-switch trials to result in a faster RT than switch trials. Furthermore, we predict that the factivity of the target animal's utterance will impact reaction times on switch trials. If the target animal

produces a non-factive utterance—which conveys more uncertainty—we expect a slower RT. While data collecting is still on-going, results from 18 children (planned N=48) suggests that children were indeed slower in the switch conditions (M=1.115) than the non-switch conditions (M=0.995). Moreover, in the switch conditions, children's RT was slower when the target animal used a non-factive utterance. Final results will be presented at the conference.

PB-42 Mobile Touchscreen Device Adaptations of Theory of Mind Tests

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Theory of mind (ToM) constitutes a basic heterogenous socio-cognitive skill crucial to proficient social functioning. First-order false belief and Faux pas tests are commonly used to measure ToM in children. However, it is unclear whether language skills and working memory could be regarded as test performance demands or competence demands and whether these demands can be decreased or eliminated. Mobile touchscreen devices (MTSDs), popular among children, present an opportunity to evaluate or decrease cognitive demands.

We aimed to develop and validate MTSD adaptations of the First-order false belief and Faux pas tests. We systematically manipulated different test features to develop an MTSD test variation that measures ToM as independently as possible from language skills and working memory. Children aged 4 to 7 years (N=73) participated in two test sessions. Traditional ToM tests were administered in person, alongside assessments of language comprehension and working memory. Additionally, participants completed one of the MTSD-based variations of both ToM tests at home, under remote video-call supervision.

Significant correlations were found between the traditional and MTSD ToM test versions, supporting validity. The MTSD test version (digital/non-digital) and the different MTSD test variations had no effect on the First-order false belief test performance. However, language skills influenced the performance more in the traditional version compared to the MTSD version. Children performed better on the MTSD Faux pas test than on the traditional one, benefiting from specific aided variations. In the future, both traditional and MTSD ToM test versions can be employed interchangeably based on individual testing requirements. In some cases, the use of aided MTSD variations may yield a more precise assessment of ToM, highlighting that language or working memory influences performance. This study bridges the gap between conventional and modern assessment methods, advancing cognitive evaluation in children.

PB-43 Cognitive Biases Toward Native and Foreign Language Speakers in Early Childhood

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Introduction
Japanese children today are increasingly exposed to foreign languages, particularly English. This exposure raises questions about its potential impact on cognitive biases —specifically, how children perceive native and foreign language speakers. Existing research indicates that young children tend to favor and trust native speakers over non-native ones (Brosseau-Liard & Birch, 2010). Conversely, in Japan, children often view speaking English as “”cool”” (Kutsuki, 2016), suggesting that social values, which emphasize the importance of English skills, could potentially shape their biases. This study examines developmental shifts in cognitive biases towards native and foreign language speakers, considering their experience in foreign language learning.
Method
Participants were 39 Japanese-speaking children aged 5-12. They were presented with silhouettes of two speakers and asked to choose the one they considered “”smart”” or “”nice””. Stimuli included Japanese (こんにちは!), English (Hello!), and Chinese (你好!) speakers, presented in “”English speaker-Japanese speaker”” and “”Chinese speaker-Japanese speaker”” comparisons. Caregivers also reported their children’s English learning period.
Results & Discussion
Under the “”smart”” condition, there was a tendency for older children to select English speakers. This tendency could result from the instillation of Japanese social values that emphasize English skills. The finding that logistic regression analysis showed no significant association with the English learning period suggests that English learning experiences have little impact on Japanese children’s cognitive biases. Other factors (e.g., influence by the media) may play a more substantial role. Under the “”nice”” condition, however, the proportion of selecting the native language speaker (Japanese) was significantly higher in most age groups. This suggests that a preference for native speakers is strong in judgments of “”nice”” speakers, rather than “”smart”” ones, and that social values could have a specific influence on children’s cognitive biases.

PB-44 What’s in the box? - The Relationship between Episodic Memory and Counterfactual Thinking in Children

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University of Stirling

Episodic memory involves recalling personal past events, while counterfactual thinking revolves around envisioning alternative outcomes to these events. Although these abilities have been studied separately in children, their interaction has received less attention, with most research focusing on

adults. Our study aimed to explore how children's episodic memory and counterfactual thinking interact and develop.

We tested children aged 3-7 (n = 64 per age year) because mature counterfactual reasoning typically emerges around age 6, and episodic memory develops between ages 3 to 5. In our study, children participated in a toy-hiding task where they hid 3 toys in 3 coloured boxes. An experimenter then altered the location of one toy (e.g., fries from the pink to purple box). After a 3-minute delay, children were asked either a 'remembered' counterfactual question presumed to rely on episodic memory (""If the fries hadn't been moved to the purple box, what would be in the purple box?"") or an 'imagined' counterfactual question requiring advanced counterfactual reasoning (""If the fries hadn't been moved to the purple box, but had instead been moved to the yellow box, what would be in the yellow box?""). Episodic memory questions (""In the beginning, which toy was in the pink box?"" and ""Which toy is in the pink box now?"") were also asked in a counterbalanced order. The box number increased with trials to add to the memory load. Our main question was whether recalling and imagining past events engaged the same cognitive processes, as indicated by the 'remembered' and 'imagined' counterfactual questions. Our findings with 6- and 7-year-olds showed no significant difference in accurate episodic memory responses, regardless of question order, suggesting a shared cognitive mechanism for remembering and imagining past events. However, we recognised the possibility of ceiling effects and extended our investigation to 3- to 5-year-olds.

PB-45 First Insights into Infants' and Children's Aha-Experiences

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An aha-experience is a sudden insight accompanied by a sense of ease that leads to positive affect and subjective certainty (Topolinski & Reber, 2010). Previous research has revealed that aha-experiences improve learning and enhance motivation. Hence, knowledge about aha-experiences in children may enable educators to enhance learning experiences.

There is limited knowledge about children's aha-experiences. This is to our knowledge the first study to examine aha-experiences in infancy and childhood. It aims to provide basic knowledge, for example, at what age they appear and on which topics. To answer these questions, we collected parental reports from two different populations (a Norwegian sample and an international sample of English-speaking parents). A content analysis of more than 600 stories of children's aha-experiences (age 3 weeks to 16 years) yielded three main findings: (1) Parents reported that children have aha-experiences already as infants; (2) Children have aha-experiences on various topics related to action and cognition; (3) The focus of the aha-stories shifts from action to cognition with age (0-8 years, Odds Ratios in Study 2 > 1.6). We replicated the findings across the two samples. Parent reports have several limitations, such as biased interpretation of behavior or lack of representativeness of the reported aha-experiences. However, no developed research methods

exist for inducing aha-experiences in children, and the youngest children cannot tell their own stories. Weighing the advantages and disadvantages, we conclude that parent reports are an appropriate method for the purpose of this first study.

Our findings provide first insights into aha-experiences in infancy and childhood and may have implications for understanding what motivates children's learning and cognitive development.

Reference

Topolinski, S., & Reber, R. (2010). Gaining insight into the „Aha"-experience. Current Directions in Psychological Science, 19, 402-405.

PB-46 Developmental changes in learning from controlled and confounded experiments

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When learning about scientific phenomena, features that are relevant for these phenomena sometimes interact, making it impossible to apply the control-of-variables strategy (CVS). Moreover, children may hold misconceptions about these phenomena that limit the causal assumptions tested during learning. As a consequence, when children learn from experiments, certain confounded comparisons (called soft interventions, see Eberhardt & Scheines, 2007), can by highly informative, while certain controlled comparisons can be misleading. In addition, scientific reasoning is subject to developmental changes (Shtulman & Walker, 2020). Thus, the informativeness of both confounded and controlled experiments may change over the course of cognitive development. The present study tests both the informativeness of different types of experimental comparisons, and its developmental changes. Children aged six to nine (target n = 168) learn about water displacement by predicting the outcome of three virtual experiments in which two balls of varying size and material are compared. Experimental comparisons are varied between-participants (controlled vs. confounded). In confounded comparisons, the larger ball is made of the lighter material. Thus, these comparisons clearly show that it is size, and not mass or material, that determines water displacement. Controlled comparisons, however, can be misleading. For example, when size is varied and material is held constant, the larger ball is also the heavier ball. Thus, these comparisons may suggest that mass is the relevant dimension. As pre-registered, we expect that posttest and transfer test performance is significantly increased in the confounded comparisons condition. Descriptive data from 54 participants tested so far initially supports this assumption (posttest: Mconfounded=0.79; SDconfounded=0.19; Mcontrolled=0.66; SDcontrolled=0.25; transfer test: Mconfounded=0.75; SDconfounded=0.22; Mcontrolled=0.46; SDcontrolled=0.26). In addition, we will apply Bayesian modeling of learning processes and explore developmental changes in the difference between conditions. Data collection will be completed in the fall so that final results can be presented at the conference.

PB-47 Investigating cooperation beyond the dyad in captive chimpanzees

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Cooperation in groups has allowed humans to overcome many challenges but the origins of our cooperative abilities are uncertain. A capacity for cooperation has been demonstrated to some extent in our closest relatives with experiments on dyads showing that chimpanzees are able to work together to produce coordinated, mutually beneficial actions. Existing experiments on dyads do not however go far in testing the limits of these abilities. Firstly, as observations from the wild of animal cooperation often involve groups larger than two, there is a gap between what we suspect about wild cooperation and what has been investigated in controlled settings. Cooperating with one other individual requires certain abilities but as the number of co-operators in a group increases, we might expect these abilities to be stretched, and cooperation to become more challenging. Thus, extending existing paradigms beyond the dyad may tell us more about the limits and constraints of non-human cooperation. Secondly, a level of success at existing paradigms such as the loose string task can be achieved by following individual aims, and animals can succeed without attending closely to their cooperative partners. In our ongoing study, we address both of these limitations by testing cooperative pulling in groups larger than two and by increasing the level of temporal coordination needed to succeed. Chimpanzees are given a modular food-distributing apparatus that can be operated individually when separated but requires simultaneous pulling by multiple individuals when connected. We hypothesise that in larger groups task failure will increase due to difficulties in coordination as well as a diminished likelihood of incidental simultaneous pulling. Preliminary results suggest that chimpanzees struggle with coordination which involves strict temporal synchrony, even in dyads. This finding extends what we know about chimpanzee coordination abilities from other dyadic and triadic paradigms such as the loose string task.

PB-48 'Why Don't You Give It a Try': Can Young Children Reason About Multiple Incompatible Possibilities in Agentive Contexts?

Leonie Baumann, Lydia Paulin Schidelko, Marina Proft, Hannes Rakoczy

Georg-August University of Göttingen

In light of recent contradictory findings, considerable debate has arisen as to when the fundamental ability to reason about multiple incompatible possibilities emerges during cognitive development. Previous explicit modal reasoning tasks have suggested that preschool children struggle to reason about incompatible possibilities until about age 4 (e.g., Beck et al., 2006; Leahy, 2023; Leahy & Zalnieriunas, 2022; Mody & Carey, 2016; Redshaw & Suddendorf, 2016). The current study investigated whether more appropriate testing conditions may reveal earlier modal reasoning competences, as a recent finding indicates that 3-year-olds are able to reason about incompatible possibilities (Alderete & Xu, 2023). To this end, the current study enriched two modal reasoning tasks with an

agentive test context in which 3- and 4-year-old children chose between an action that must lead to a reward and an action that might lead to a reward. Agentive modality, pertaining to what can be done rather than what is the case, has been suggested to be an early emerging form of modal cognition (Vetter, 2022). In contrast to previous studies where children had to react to the actions of an experimenter, in the current study, the children performed the chosen action themselves. Moreover, it was investigated whether children's performance in the modal reasoning tasks is related to their Theory of Mind (ToM), which was assessed with a change-of-location false belief task. Results show (i) children perform better in some tasks with an agentive test context, (ii) not differently in others (iii) and that there are no correlations. The effect of an agentive test context is therefore inconclusive. Differences between the modal reasoning tasks in the current study and potentially performance limiting as well as performance enhancing factors are discussed.

PB-49 Young children protect rule-breakers to repay a favour – even though they know better

Louisa Huff, Sebastian Grueneisen

Leipzig University

Sanctioning norm violations is critical for the maintenance of cooperation. Nevertheless, norm violations often remain selectively unpunished based on the norm enforcer's relationship with the transgressor (e.g., a regulator ignoring an associate's transgressions). The resulting unequal norm enforcement constitutes a central facet of corruption with potentially detrimental effects for society. Young children enforce norms and return favours to cooperative partners (direct reciprocity) from early in development. However, a largely unexplored question is the extent to which direct reciprocity, a cornerstone of human cooperation, compromises children's tendency to enforce norms equally. In two preregistered studies, we contrasted children's third-party judgment of unequal norm enforcement (Study 1) with their behaviour in a first-party context (Study 2). In Study 1, we presented 4- to 7-year-old children with two vignettes involving the enforcement of a no-cheating norm. Starting from five years of age, children disapproved of inconsistent norm enforcement for cheaters (even though they were not generally averse to unequal treatment and approved of this when justified). In Study 2, we placed 5- to 7-year-old children in a game context where they witnessed their game partner cheat. This partner had either previously done them a favour (reciprocity condition) or behaved neutrally (control condition). Across ages, children were slower and less likely to tattle on the transgressor in the reciprocity than the control condition, both spontaneously and when asked directly, necessitating a lie. In stark contrast to this, during a short vignette immediately after the behavioural task, over 80% of children advised a story protagonist to tattle on a transgressor who had previously helped them, including children who had not tattled themselves, revealing an intriguing knowledge-behaviour gap. These findings showcase a previously disregarded "dark side" of reciprocity: From a young age children protect transgressors who have helped them, even though they know better.

PB-50 Training children's understanding of natural numbers using visual and linguistic compositional cues

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Children are equipped with non-symbolic systems for representing numbers: The Parallel Individuation (PI) system supporting exact representations of small quantities (e.g., 1, 2, and 3) and the Approximate Number System (ANS) supporting imprecise representations of quantities (e.g., 30 vs 60). The question of how children create exact representations of large numbers (e.g., 5 vs 6) remains open. One proposal suggests that compositional language, showing bigger numbers (five pets) as a composition of smaller ones (three cats and two dogs), might allow children to learn their meanings (Spelke, 2017). Our study tests this by evaluating the benefits of a short training, using compositional cues (linguistic and visual), on children's understanding of 'five' or 'six' by comparing it to a training condition without compositional cues.

In our preregistered study, participants (n= 90, age: 2.5-4-years) will complete three tasks: (1) adapted point-to-X evaluating prior number-knowledge, (2) training with sets of five or six, and (3) posttest evaluating understanding of five and six across different trials (with visual and linguistic cues, only visual cues, only linguistic cues, or no cues). We plan to complete data collection by the date of the conference. If we are unable to do so, we will present trends from the data we have. In a pilot (n=20), we found the control group performed slightly better than the compositional group in the posttest overall. However, in posttest trials with only linguistic cues, the compositional group performed better than the control. This trend indicates there might be an advantage for compositional language in the absence of other cues.

We aim to study how children might acquire natural number concepts, as a case study to better understand the role of language's combinatorial capacities in developing concepts that stem from, but are not limited by, our innate capabilities.

PB-51 The Emergence of Collaborative and Competitive Behaviour: Insights from Kinematics

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Birkbeck, University of London

Humans are an ultrasocial species, interacting with each other constantly. Collaboration and competition are two complementary forms of social interaction. When collaborating, partners work together to achieve a shared goal; partners have opposite goals when competing, and one person's win is linked to the other person's loss. Collaborative and competitive behaviour emerges throughout childhood and involves sophisticated cognitive and motor skills. Recent studies revealed that social cognition can be inferred by motor behaviour. For example, adults showed different reach-to-grasp patterns when performing the same action collaboratively versus competitively. There is a growing

body of research that links kinematics to cognition, yet more needs to be known about how the kinematics of collaborative and competitive behaviour emerge over development. Here, we aim to (1) examine the emergence of motor markers for collaboration and competition and (2) test how a partner's kinematics impact those markers. We tested school-aged children (6- to 10-year-olds) and an adult actor in a building tower task while they wore motion trackers to record their moment-to-moment kinematics. In this between-subjects design, one group of children (n = 40) collaborated with the adult to build a two-block tower, and the other group (n = 15) competed with her as to who placed their block on the bottom of the tower first. In some trials of both conditions, the adult partner was covertly instructed to change her movement patterns to assess how her kinematics influenced the child's motor patterns for collaboration and competition. Findings reveal unique motor patterns for collaboration and competition, and these patterns are sensitive to the partner's kinematics. Although more data is needed to establish motor markers for competition, our findings provide insights into the origins of social behaviour and how they relate to human movement.

PB-52 Children's Experience and Understanding of Aha-Experiences

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An aha-experience is a moment of sudden understanding followed by a characteristic set of epistemic feelings of certainty, ease, and positive affect (Topolinski & Reber, 2010). Despite evidence from studies with adults that aha-experiences benefit learning (e.g., Kizilirmak et al., 2016; Liljedahl, 2005), little systematic research on children's aha-experiences exists. The current preregistered study asks how children experience and understand aha-experiences. Children (age: 4-8 years, N = 160, 47% girls) solved a picture clues task inspired by the Remote Associate Test (Mednick, 1962), a task commonly used to study insight in adults (Kounios & Beeman, 2014). In this task, children saw three clues and were asked to find a solution word that was associated with the three clues (e.g., SNOW; SCARF; CARROT, solution: SNOWMAN). The number of observed and self-reported aha-experiences was recorded. Children also solved a set of tasks to assess their understanding of aha-experiences. We found that while the number aha-experiences was stable across age, there was a clear development in understanding of aha-experiences. That is, children's ability to recognize their own aha-experiences as well as their general understanding of the aha-concept increased with age. Our findings indicate a lag between children's aha-experiences and their understanding of aha-experiences, where children first have aha-experiences (perhaps from infancy, see Haugen et al., 2023) and later develop an understanding of these experiences. This finding is in line with the literature on metacognitive activities and knowledge (e.g., Flavell, 1993; Lyons & Ghetti, 2010) and emotional experiences and understanding (e.g., Harris, 1989; Pons & Harris, 2019). See also Piaget's distinction between practical success and conceptual understanding in the development of consciousness (Pons & Harris, 2001).

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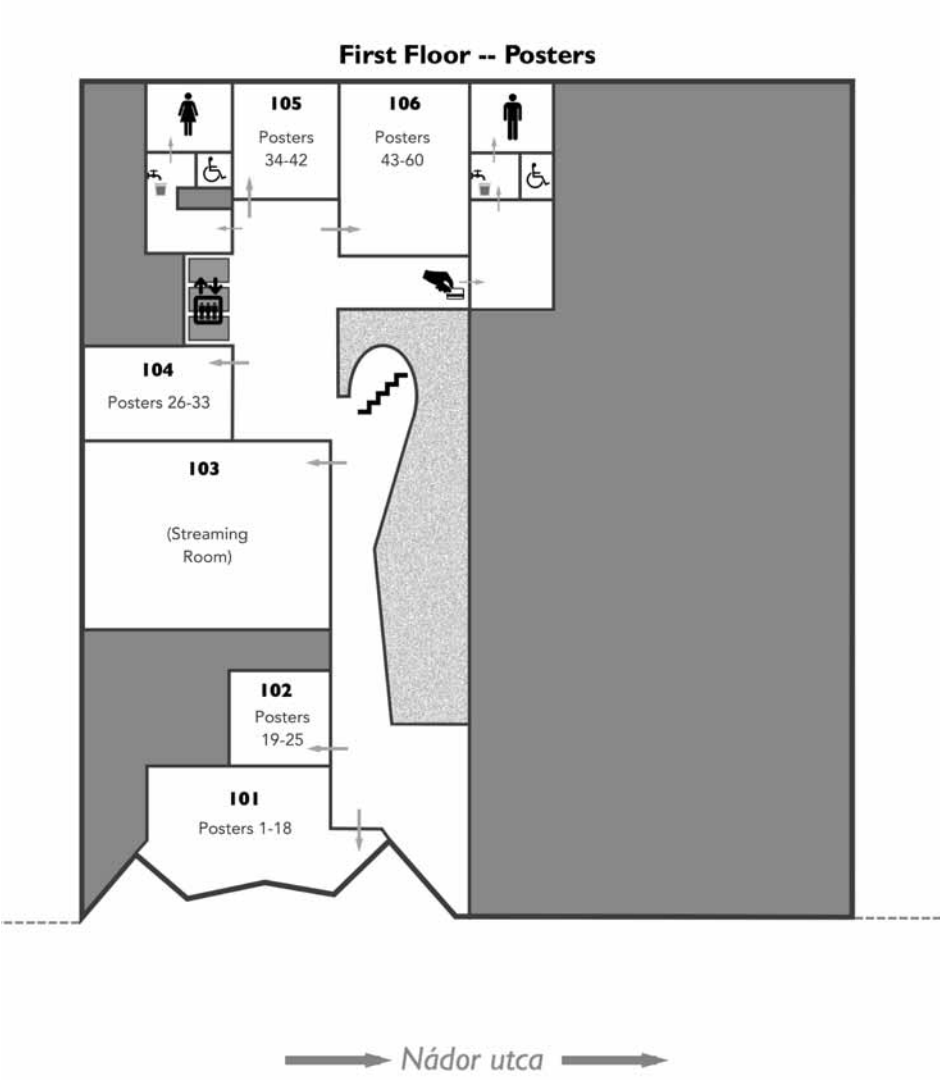
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34-42
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Posters 26-33
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PC-01 Ordered arrangements turn into signs: kindergarteners systematically assign a unique referent to a novel sign

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Ordered arrays are good candidates for being a sign. Unlike random arrangements, they are distinguishable from each and easy to reproduce. Our question is whether, prior to formal education, children spontaneously treat ordered object arrays as signs. Specifically, in Experiment 1, we explored whether kindergarten age children consider ordered arrangements to be better triggers of referential expectations than random ones. We tested this question by turning a referent disambiguation paradigm into a hide-and-seek game. We presented two groups of five-year-olds with animations in which the main character hides at one of three possible locations. The seeker finds an ordered arrangement that, unbeknownst to participants, indicated the hiding location. Two different ordered arrangements appeared, each of which was informative of a hiding location, leaving one location 'unsigned'. At test, either a novel ordered (Sign Group), or a novel random (Random Group) arrangement appeared while children were asked to predict the location of hider. We found that the arrangements did guide children's decisions: assuming that sign-referent relations are mutually exclusive, they pointed to the novel, 'unsigned' referent above chance in both groups. Contrary to our prediction, this finding suggests that children map a novel array to a novel referent regardless of its level of entropy. In Experiment 2, we tested how systematic children are in their sign-referent mappings when more than one 'unsigned' referents are available. We increased the number of 'unsigned' referents to two. We found that 16 (out of 24) children who selected a novel location as a potential referent consistently mapped a sign to a specific referent in 85.60% of the trials. Based on these results, we conclude that prior to formal education, children consider ordered arrangements as signs that refer to a unique referent, and efficiently identify the referent of a novel sign by reasoning by exclusion.

PC-02 Young children's ability to plan for mutually exclusive possible events in the present and future

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Boston University

Young children struggle to plan for future events that lead to multiple possible but mutually exclusive outcomes. For example, 3-year-olds who were asked to catch a marble that would be dropped into the top of a tube with two exits often placed their hand under only one of the exits, even though the marble could come from either exit; 4-year-olds placed hands under both exits (Redshaw & Suddendorf, 2016). In these tasks, children have to 1) prepare for an outcome that has not yet happened (future-oriented thinking), and 2) represent mutually exclusive locations for the ball's final position (representing

possibility). We asked whether just one, or both, of these processes impacted younger children's performance. In Experiment 1, n=96 3-4-year-olds participated in a modified version of the Two-Exit Tube task. Half completed the original version of the task (requiring both future-oriented thinking and representing possibility; Future condition). For the other half, the ball was dropped into the tube and landed in one of two opaque boxes placed over the tube exits. Children were then asked to catch the ball after the boxes were opened. Thus, to plan their action, children needed only to reason about the current possible location of the ball (not requiring future-oriented thinking; Present condition). We reasoned that, if younger children's difficulty is related to future-oriented thinking, they should perform better in the Present condition than the Future condition. By contrast, we found no significant differences across conditions. In Experiment 2 (n=96), we developed a novel version of the task that makes fewer demands on motor coordination and again found no differences between the Future and Present conditions (although 3-year-olds did better overall). Our results suggest that the primary limiting factor on children's performance may be their ability to take actions on mutually-exclusive possibilities, rather than future-oriented thinking.

PC-03 Partner choice in a cooperative tablet game

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How do children choose with whom to engage in collaborative endeavours? Can they use information from observed third-party social interactions to infer agents' traits and select partners who are willing and able to provide benefits to them? In this study with 5- to 10-year-old children, we addressed these questions by using a touchscreen foraging game designed to study partner choice. Here participants watch and play with animated agents who vary along specific traits (competence, prosociality) and where a player's payoff depends in part on their partner. In Experiment 1, we found that children (n=60) were adept at recognizing differences in the agents' behaviors when an experimenter asked about these differences explicitly, identifying which agent was relatively more competent and helpful. However, when children (n=65) played the game independently and had to select and subsequently play with the chosen partner, only their preference for a helpful over a selfish agent was above chance; they did not choose a more skilled collaboration partner (Experiment 2a). A sample of adults (n=32) tested with the same stimuli did show pronounced preferences for both helpful and skilled partners (Experiment 2b). When we modified the procedure to simplify the task and highlighted its collaborative, rather than competitive, nature, children (n=60) also successfully chose more helpful and skilled agents to play with (Experiment 3). Finally, in Experiment 4, 7- to 10-year-old children (n=121) additionally participated in a condition where the two traits were in contrast with each other (i.e., a helpful but incompetent versus a skilled but selfish agent); here they overall prioritized their partners' skill. The study sheds light on the mechanisms of partner choice in children, and highlights the importance of using experimental designs to study social cognition that do not merely rely on vignette stimuli and experimenter prompts.

PC-04 Can a humanoid robotic talking head teach new words to toddlers?

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Can we use robots to teach infants language? Studies show that infants can follow robots' gaze (Meltzoff et al., 2010), but that they only look longer to the object when gazed by humans, unless the robot displays clear ostensive signals (Okumura et al., 2013b, 2013a). Similarly, toddlers could not learn new word-object relationships when taught by a robot, while they could with a human (O'Connell et al., 2009). These studies suggest a limited potential of using classic (mechanistic) robots for infant language learning. However, could more human-like robots succeed in teaching words to toddlers? Here, we run a word learning task in 18-, 24- and 36-month-olds (N=59) using a "Furhat robot". This humanoid robot is temporally-contingent and acts as a social agent. It is a 3D lamp avatar that escapes the Mona Lisa effect, orients his head and gaze towards the infant, and speaks with non-mechanic human-like lip movements. In the learning phase, the robot looks at one of two objects (Figure 1) and names it three times. At test, it looks at the infant and asks for an object: first for the named one and then for a new word (mutual exclusivity). Toddlers underwent this process two times, and then repeated the test phase (retention). Results showed significant word learning and retention (target-looking > distractor-looking, see Figure 2) in 36- (ps <. 001) but not in 24- nor 18-month-olds (ps > .05). Given that using the same paradigm, 24-month-olds could learn the words from a human speaker (Birulés et al., in prep), these results suggest that the naturalistic features of this robot improved the interaction and allowed infants' learning, although requiring an older age. These results are promising for future studies that explore the use of humanoid social robots for infant language learning.

PC-05 Impact of very premature birth on visual statistical learning abilities in infancy

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Many studies have highlighted the infants' ability to extract regularities in their environment. These statistical learning abilities are of primary importance since they form the basis of children's abilities to organize and form coherent representations of the external world. How the constraints linked to cerebral maturation and to the infant's experience with their environment interact with SL mechanisms remains an open question.

Using an infant-controlled habituation paradigm in which three doublets of shapes were presented randomly, one shape at a time, we examined infants' ability to differentiate between sequences of shapes of high, low, and null transitional probability (TP), after habituation. We tested 8- and 10-month-old full-term infants, and very preterm infants at 8 months of adjusted age. Preterms

were therefore paired on postmenstrual age (i.e., the age calculated since conception) with the youngest full-terms – that is, they share the level of cerebral maturation but have more ex-utero experience, and on chronological age (i.e., the age calculated since birth) with the oldest full-terms – that is, they share the amount of experience with the external world but have less mature brains. In both the habituation and test phases, we observed an association between global looking times and post-menstrual age, with 8-month-olds and preterms looking more to the shapes than 10-month-olds. The attention devoted to visual stimuli would thus mostly depend on cerebral maturation. In the test phase, results revealed a typical developmental pattern: while 8-month-old full-terms showed a familiarity preference (i.e., they looked more at high and low than at null TPs doublets), 10-month-old full-terms showed a novelty effect. Critically, preterms likewise exhibited a novelty effect. These findings thus demonstrate that preterms benefit from their early exposure to regularities outside the womb, and support that, at that age, visual SL abilities depend more on experience than on cerebral maturation.

PC-06 Gaze crossing experiment: a new paradigm to investigate real-time infant-adult interaction

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Social interaction draws the attention of infants from a very young age and facilitates their development in various domains. This facilitative effect of social interaction has been extensively studied, but most existing studies either had well-controlled experimental settings but merely exposed infants to communicative signals unidirectionally, or measured infant-adult interaction in naturalistic and therefore complex settings. To assess the effect of interaction in itself, we developed a gaze crossing experiment that measures bidirectional real-time interactions between infants and adults by exposing them to the temporo-spatial patterns of social interaction disentangled from other elements. An infant and an ignorant adult experimenter are seated separately from each other, facing a screen respectively. They explore a veiled 2-D virtual space reciprocally in a search game setup. Their gaze on the screen functions as a spotlight that unveils the region they are looking at. Both can encounter three identically looking objects: an “other” object that represents the real-time gaze of their partner, a “shadow” object that is not interactive but has the same amount of spatio-temporal movement as “other”, and a “static” object that stays in the same place. The infants (n = 35; age range = 8 to 14 months, mean = 320 days) explored freely, and the adult experimenters were instructed to identify the “other” object and stay with it. The only cue that infants can use to identify the interactive partner is thus the contingency of movement. Our results show that infants were able to do so in these abstract conditions, encountering the “other” object more frequently and looking at it for longer durations compared to the remaining objects. Further analyses explore the synchronization and coordination

in the eye movement of infant-adult dyads. These findings show the potential of gaze crossing to examine infant-adult interactions under rigorous experiment control.

PC-07 Lotta likes everything that makes a sound! Do 2-year-olds use information on others' penchants during social interactions?

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At 12 months, infants use information on a person's subjective attitude towards an object as a hint towards that person's later goals (Phillips et al., 2002). Further, 18-month-olds integrate their knowledge on another person's likings in their own behavior when interacting with that person (Repacholi & Gopnik, 1997). Thus, it can be expected that 2-year-olds successfully use information on another person's goals and penchants during social interactions. However, in most studies focusing on action goals those goals consisted of objects that are to be grasped or manipulated, thereby only reflecting one part of common real-life action-goals. Many everyday actions (e.g., pressing a button) are rather performed with the goal to elicit a particular effect (e.g., a light). Representing this kind of action goal poses a particular challenge, as children need to represent a person's liking towards something that is only perceivable upon performance of a particular action. The current study examines whether 2-year-olds systematically use their knowledge regarding the penchant shown by two others for different effects (i.e., sounds or lights) in later interactions. Children were successively presented with two hand puppets, each of which presented their favorite toys producing either a sound or lighting up, thereby expressing each puppet's liking of a particular effect. Then, the child learned two tool-use actions that allowed to elicit either a sound or a light. In two following test-trials, the puppets reappeared asking the child to do something that "makes me happy". If children preferably perform the action leading to the effect congruent to the puppets' liking, this would indicate that they built correct puppet-effect associations and integrated that knowledge into their own actions. Additionally, besides a sensitivity to complex action goals related to action effects, it would indicate a tendency to use information on another persons' subjective desires in a prosocial manner.

PC-08 Moral Judgment of Extrinsically-driven Prosocial Actions: A Developmental Study Through Middle Childhood

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Prosocial actions are voluntary actions intended to help others, but not all prosocial actions are motivated by altruism, which is the concern of others without personal gain. Much previous research

has shown that adults dislike prosocial actions with extrinsic motivations, such as economic or reputational rewards (Carlson & Zaki, 2018). However, few studies have assessed the judgment and its development of prosocial actions with extrinsic motivations in children, which is our aim. We hypothesize that older children will judge extrinsically-driven prosocial actions less favorably, while the judgment of self-interested actions remains comparable through development. In the present study, we collected responses from children aged 6 to 11 via video meetings (data collection ongoing, n=232) and adults via online questionnaires (data collection completed, n=290). We present cartoon stories depicting various actions to the participants and ask them to judge the character and action after hearing or reading each story. Participants are randomly assigned to four conditions, varied in the type of action presented in the story (prosocial or self-interested) and whether an extrinsic motive is explicitly stated (ambiguous or explicit). Preliminary analysis found that: 1) Judgments of ambiguous self-interested and prosocial actions remain comparable across children and adults. 2) As children age, they increasingly disapprove of actions with self-interested motives, regardless of whether the action is prosocial or self-interested. Previous research has almost exclusively framed extrinsic motives as a punishment in the judgment of prosocial actions. However, our results indicate that its negative effect on judgments may apply to a broad range of actions, including non-prosocial ones, which calls for a more comprehensive framework in moral judgment of prosocial actions.

PC-09 Origins of Musicality and the Influence of Music and Rhythm on Social Behavior in Children Aged 3 to 6

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Université Paris Nanterre

Music has existed in humans for at least 40,000 years and is present today in all societies. Its perception, appreciation and production are based on some cognitive abilities commonly referred to as “musicality”. Some authors have suggested that musicality may have an evolutionary origin: it may have evolved because music promotes group cohesion. This hypothesis is supported by studies in developmental psychology showing that joint music-making promotes empathy in 8 to 11-year-olds, and cooperation and helping in 4-year-olds. However, many questions remain unanswered, particularly regarding the effects of music listening on social behavior, the conditions under which such effects may be observed (e.g., individual versus joint listening), the musical properties and mechanisms involved (e.g., the role of rhythm and interpersonal synchronization), and the broader evolution of musicality across the living world. In 2017, we already demonstrated a positive influence of joint listening to classical music on social interaction in a cooperative task context in children aged 3 to 6 and in a parrot species, cockatiels (suggesting convergent evolution in humans and certain birds, thus supporting a partly biological, not just cultural, origin of musicality). The study presented here focuses specifically on children but is also part of a larger comparative project involving humans, non-human primates, and birds. For children, we showed that percussive, rhythmic electronic music

fostered more social interactions and cooperation among pairs of 3 to 6-year-old children compared to classical music (Mozart's Sonata K448), white noise, a "scrambled" version of the stimulus, or silence. The role of rhythm and interpersonal synchronization will be further explored in the future by testing the influence of new stimuli listened to together or separately, with or without concurrent music production. We also plan to examine the spontaneous movements of individuals during listening and their relationship to observed behaviors in subsequent prosocial tasks.

PC-10 Can children leverage consensus and source independence to get better advice?

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The ability to selectively learn from competent informants emerges very early in development (e.g., Rakoczy, Ehriling, Harris, & Schultze, 2015). In the absence of verifiable competence, young children, like adults, rely on the consensus of potential advisers (Kim and Spelke, 2020). However, it is not clear when children develop more sophisticated intuitions regarding how the composition of social groups, e.g. the way in which they acquire and aggregate information, impacts the perceived quality of the resulting advice.

This experiment assessed children's developing sensitivity to source independence - that is, do they understand that statistically independent sources of information are more valuable than correlated ones (sometimes even when they form a majority)? Further, we assessed whether reliance on consensus vs. source independence is modulated by the way in which advice is produced: individually (and independently) or via aggregation by group deliberation. While deliberation weakens independence, it has other benefits that children may be sensitive to (see Richardson & Keil, 2022). Children (ages 3 years to 14 years old, N = 300) played a space exploration game in which each trial corresponded to a new decision-making challenge which could only be accomplished with the help of 8 friendly aliens. These aliens then provided advice (either Individually or by Deliberating in two groups) in the form of one of two possible suggestions. Participants were then asked to make a 2AFC decision and rate each option. Across trials and participants, we manipulated consensus (i.e, how many aliens endorsed each option) and source diversity (i.e., how many identical aliens - who give identical suggestions - were part of the consensus). Preliminary results suggest that older children's choices were influenced by source independence, even overriding consensus. However, we did not find differences as a function of the way in which advice is produced.

PC-11 Impact of Age and Race on Face Recognition in 9- to 12-Month-Old Infants

Aslı Bursalıoğlu, Nhi Duong, Cidnee Hall, Owen Caldwell, Maya Martin, Maggie Guy
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The other-race effect is a bias that leads to more efficient processing of faces of one's own race and is evident at around 9 months of age. The age of an individual also impacts infants' face perception, with better recognition of ages that they are exposed to regularly. In the current study, we recruited 9- to 12-month-olds to participate in an online study via Lookit to understand the effect of race and age on face recognition. Twenty-seven infants were recruited and assigned to see faces of either children or adults. Participants completed a familiarization phase with an own-race face, followed by a visual-paired comparison (VPC) trial including the familiar-own-race face and a novel-own-race face. In the other familiarization phase, they viewed an other-race face, followed by a VPC trial with the familiar-other-race face and a novel-other-race face. Looking preferences were measured using one-sample t-tests and correlations. We expected to see a novelty preference during the VPC if they recognized the familiar face. The preliminary findings indicated no novelty preferences. Both White (N=6) and non-White (N=8) participants that viewed adult faces displayed significant positive correlations between looking times during other-race familiarization and the familiar-other-race face during the VPC. These results show that during familiarization, infants may not have completely processed the other-race face and needed to allocate more attention to it during the VPC for further processing. White participants who viewed child faces (N=7) displayed a significant positive relationship between looking during the other-race familiarization and the novel-other-race face during the VPC, showing signs of recognition by looking longer to the novel face. Data collection is ongoing, and we aim to have 100 participants in the final sample. This study will be followed up by data collection in the laboratory using the same paradigm to compare online and in-person data.

PC-12 Can children learn how to solve problems from storybooks?

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Reading books is one of the most preferred pastime activities for young children. It is important to examine whether and what kind of information children learn from storybooks and what kind of books promote learning. In this study, we tested how the story theme (i.e., realistic, anthropomorphic, or fantasy) and the problem context (i.e., physical or social) influence children's learning by replicating and extending Richert et al. (2009). Ninety-one 4-, 5-, and 6-year-old children (46 girls; Mage = 64 months, SD = 9.3 months) were randomly assigned to one of the three story theme conditions. Children were firstly given four source stories (2 social and 2 physical) which include both the problems and their solutions. Then they were read transfer stories which had almost the same problem as the source stories, and children were asked to state a solution for the problem. For social problems, there were no significant main effects or interaction. However, for physical problems, the main effects of story

theme and age were significant, but the interaction was non-significant. Post-hoc analysis indicated that children in reality themed condition had higher transfer scores in physical stories/problems than children in other story theme conditions which were not different from each other. In addition, 6-year-olds had higher physical transfer scores than both 4-and 5-year-olds (whose scores did not differ from each other). Similar to earlier findings (e.g., Richert et al., 2009) children learned better from realistic themed stories rather than fantastical ones, but only in stories highlighting physical problems. We also found an age effect, which might reflect that cognitive abilities or previous experience might play a role in learning from stories. However, the fact that age and story theme effect were only found for physical stories, but not for the social ones requires further investigation.

PC-13 Anticipatory visual responses in the human fetus

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Visual orienting during infancy is a key building block for social processes, including understanding facial expressions, eye contact and action perception (Johnson, et al., 2008). Our knowledge of human fetal visual perception is rudimentary, including how the fetus interacts with the visual world. The current study investigates the presence of anticipatory visual gaze in the fetus. Specifically, can fetuses use an auditory cue to anticipate the appearance of a light stimulus? The final dataset comprised 69 singleton fetuses between 33 and 36 weeks gestation. 2D ultrasound was used to visualise the fetal lens and record fetal eye movements. A modified version of the Visual Expectation Paradigm was employed. We hypothesise that fetuses will demonstrate eye movements towards a specific location (in which no visual stimulus is present) when they hear an auditory cue that has been previously paired with a visual stimulus presented in that same location. Preliminary analyses of the collected data indicate that the amount of eye movements in the light present (median:4, SD: 5.52) and the light absent (median: 4. SD: 4.04) conditions were the same (Wilcoxon signed-rank test, V = 402.5, p-value = 0.719) suggesting that fetuses can perform anticipatory gaze. Detailed analysis of the dataset may reveal distinct trends that are not currently reflected in the preliminary analysis. Investigating anticipatory gaze illuminates how fetuses engage with the uterine environment. Understanding visual orienting in utero informs our understanding of perceptual processes and the foundations of higher-level cognitive functions that could have their origins in the prenatal period.

PC-14 Conversing with the Mind: The Relationship between Parental Reflective Functioning and Parents' Mental State Talk with Children

Nursena Koç, Berna A. Uzundağ
Kadir Has University

Children's understanding of their own and others' mental states (i.e., theory of mind [ToM]) is a cornerstone for effective social interaction (e.g., Jenkins & Astington, 2000). Although parental mental state talk (MST) has been identified as an important factor for children's ToM development, the reasons behind the individual differences in parental MST are understudied. Here we investigate whether parental reflective functioning (PRF; i.e., parents' capacity to understand and differentiate their own and their children's mental states), is a potential factor driving individual differences in parental MST. Through video conferencing, we gathered data from 89 mother-child dyads (49 girls, age range=48-69 months, M(SD)=57(5.49)). Mothers' PRF was assessed by using the Parental Reflective Functioning Questionnaire's three subscales: parents' interest and curiosity in their children's mental states (e.g., "I try to see situations through the eyes of my child."), certainty about mental states (e.g., "I always know what my child wants."), and prementalization (e.g., "My child's behavior is too confusing to bother figuring out.") (Luyten et al., 2017). We asked mothers to narrate a wordless picture book (Mayer, 1969) to their children to assess their MST and coded their narrations in different categories (i.e., desire, affect, cognition, etc.) (Ilgaz et al., in prep.). Results revealed that mothers who reported greater interest in their children's mental states produced more MST overall (rs=.24, p=.02) and used more perception (rs=.21, p=.05), physiological (rs=.21, p=.04), desire (rs=.25, p=.02), affective (rs=.21, p=.05), and cognitive terms (rs=.23, p=.03). Mothers' prementalization was only negatively related to contrastive terms (rs=-.23, p=.03). Certainty in mental states was not related to MST. In summary, PRF, more specifically, parents' interest in their children's mental states, may lead parents to use mental state terms more frequently and diversely to understand their children's minds and to scaffold their mental state comprehension.

PC-15 Processing ease guides toddlers' interpretation of novel cues

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Efficient cognitive systems avoid unnecessary costs. Thus, efficient learners should focus on hypotheses that are easy to process rather than on more costly ones when interpreting a novel cue. This tendency towards simplicity should be evident in communicative contexts, since speakers imply that what they communicate is worth processing, with no unjustified processing costs (Sperber & Wilson, 1986). We tested this hypothesis in a study in which toddlers (N = 36) had to find a reward hidden under one of two opaque cups. An experimenter provided information about the reward's location by placing an unfamiliar cue (a marker) on one of the cups. In the negative condition, the experimenter told explicitly that the marker was placed where the reward was not. In that case,

participants found the reward more often than predicted by chance (p = .013). Thus, toddlers could locate the reward by excluding the marked cup. Crucially, in the ambiguous condition, the experimenter did not clarify explicitly what the marker conveyed. In that case, the marker could be treated as indicating the location of the baited cup either directly (by marking it) or indirectly (by marking the empty opaque cup that needed to be excluded). Crucially, finding the reward by excluding one empty location is costlier than learning directly where the reward is. Toddlers favored the least costly interpretation of the cue. In the ambiguous condition, participants searched for the reward under the marked cup more often than in the negative condition (p < .002), and more often than predicted by chance (p < .001) — even if, actually, the marker was always placed on the empty cup. Thus, toddlers' processing of ambiguous novel cues is shaped by processing ease. These data also reveal that young learners exert pressure favoring cognitive efficiency in communicative systems.

PC-16 The effect of labelling and sustained attention during parent-child interaction on novel-word retention

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The novelty of an object for a child impacts how parents interact with and talk about the object (Chen et al., 2021), and how children handle these objects (Schatz et al., 2022). Additionally, parental input such as object labelling, and features of parent-child interaction such as joint and sustained attention impacts children's vocabulary size (Peters & Yu, 2020). Against this background, the current study examines parent-child interaction, parent labelling and children's handling of objects when they naturally interact with objects varying in their familiarity to the child. Furthermore, we examine how this quality of interaction influences children's learning of these novel word-object associations. In particular, we investigated whether (i) parents lead more instances of joint attention when playing with novel relative to familiar objects, (ii) parents preferentially label novel relative to familiar objects and (iii) children's learning of novel word-object associations is affected by the frequency of labelling and children's sustained attention towards the objects. We recruited 29 parent-child dyads (age range of children: 14-23 months old), who were asked to play with four different toys – two familiar and two novel to the children (but familiar to the parents) – as we examined their eye-movements and labelling behaviour during the play phase. Following that, we tested children's recognition of the labelled novel objects. We find that (i) parents led more novel object JA instances (ii) a higher frequency of object labelling behaviour during familiar object play compared to novel object play. However, we found (iii) no improved recognition of novel toys if these toys were frequently labelled when they were attending to the toys. Such findings would highlight how the quality of social interaction between caregivers and infants is influenced by the objects in their natural environment, and that novel word retention is currently not influenced by these factors.

PC-17 Toddlers adapt their exploratory strategies to the information structure of the task

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We investigated across two studies whether toddlers are ecological active learners, that is, whether they are able to select those active learning strategies that are most informative depending on the characteristics of the task at hand.

In both studies, children (N = 137, 2- to 3.5-year-olds) are shown a ball rolling down through a transparent marble run, which has four exits at the end. Children are familiarized with two different structures of the marble run: In the Uniform condition, all the passages are open, so that the ball is equally likely to fall from any of the four exits. In the Skewed condition, only one passage is open, so that the ball always falls from the same exit.

In the Search version of the task (Study 1), the four exits correspond to four boxes. Children at test are asked to close their eyes during a marble run and then have to choose which of two exploratory actions to perform to find in which box the ball has fallen. Children can either reach inside one of the boxes or look inside the boxes by removing the lid that is covering them all so that they can see where the ball has fallen and reach inside the correct box. In the Catch version of the task (Study 2), children at test have to choose which of two boxes to use to catch the ball running through the marble run. The Small box covers only one exit, whereas the Large box is more difficult to handle, but covers three exits.

Preliminary results suggest that in both versions children tend to choose the correct action, that is, the most efficient to find the ball, suggesting that even 2-year-olds are capable to tailor successfully their exploratory actions to the different likelihood distributions.

PC-18 Parents' and infant's vocal contingency during dyadic and triadic interactions

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Infants' development is known to be facilitated by parental contingent behaviours, even if little is known about the mechanisms through which social contingency influences development (Gordon & Feldman 2010, Feldman, 2007; Goldstein et al, 2003, 2008). Research on infants' social contingency has focused mainly on dyadic aspects of the mother-infant or, more rarely, the father–infant interaction (Provenzi et al., 2018; Lamb, 2010). Moreover, few studies addressed family functioning at a microanalytic level taking into account a real triadic level, rather than the various subsystems (Cox & Paley, 1997; Feldman, 2007, Gordon & Feldman 2008). This study aimed at investigating the vocal contingency patterns during dyadic and triadic interactions (mother–father–infant) through a semi-structured procedure. Vocal contingency was defined as a vocalisation occurring within 2

sec from the offset of the previous partner vocalisation (Goldstain & Schwade 2008). Preliminary results on a sample of 30 triads with 4-month-old infants indicate that, despite mothers' number of vocalizations being greater than fathers' during both dyadic ($t(3252) = 9.85$, df =, $p < .01$) and triadic interactions ($t(1314) = 6.82$, df = 1314, $p < .01$), parents' vocal contingency rate to their babies is comparable. Infants' contingent vocalisations to mothers and fathers are also comparable during dyadic interactions. During triadic compared with dyadic interactions, however, infants' vocalisation rates increase overall, but these vocalisations become less contingent on both caregivers ($F(1,2) = 24.48$; $p < .01$), and the likelihood of a caregiver vocalizing contingently towards the infant increases ($F(1,2) = 213.2$; $p < .01$). During triadic interaction, infants are more contingent to fathers than to mothers ($F(1,2) = 213.2$; $p < .01$). In future analyses we shall explore the fine-grained time dynamics that drive these differences in vocalization rates and contingency between dyadic and triadic interactions.

PC-19 Intra- and interpersonal mechanisms in the ontogeny of prosocial behaviour: two studies using posture as an indicator of affect

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Emotions, especially prosocial emotions such as gratitude, sympathy, and guilt, influence prosocial behaviour from early on in ontogeny. One of their main functions is to maintain and repair social relationships (Vaish & Hepach, 2020). In the present research, we address the relationship between prosocial emotions and prosocial behavior both from an intra- as well as an inter-personal perspective, relying on a non-verbal measure: Prior work has shown that an upright posture is indicative of positive emotions, and a slumped posture of negative emotions. Specifically, we investigate whether experiencing positive emotions leads to more sharing than negative emotions (intrapersonal). Moreover, we study whether children take emotion expressions of the target in need of help into account in their own prosocial behavior (interpersonal). In Study 1, we experimentally induced emotions, presented in semi-randomized order, in children aged 5 to 10 years. Children listened to a short story, and also told one themselves for validation check of their understanding. Following each emotion induction, children were asked how much marbles they were willing to share. Emotional valence is assessed via body posture, and prosocial behavior is measured via sharing of marbles.

In Study 2, we provide children with vignettes describing social and non-social situations. In study 2a, we ask children to select which of several target persons matches the situation, with the posture stimuli ranging from slumped to upright. In study 2b, we investigate how the expression of situation-appropriate and inappropriate (pro)social emotions affect children's prosociality. Children are presented simultaneously with situations and congruent/incongruent posture, and we assess whether children are more willing to help/share with a child who displays emotions that match the respective situation. Results are discussed with respect to the mechanisms underlying prosocial behavior, as well as with respect to the usefulness of body posture as a measure in affective science.

PC-20 How do 3-year-olds understand mutually exclusive possibilities in a social context?

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Prior research on modal thought has yielded conflicting evidence regarding the development of children's ability to represent mutually exclusive possibilities. While some studies suggest that even infants and non-human animals understand possibilities to some degree, older children struggle with considering multiple alternatives in a variety of experimental paradigms (such as the 3-cups-task, e.g., Mody & Carey, 2016). Given these convergent and surprisingly robust findings, it is often concluded that children below the age of 4 are not yet capable of modal representation of possibility. One view claims that 3-year-old children still lack the logical concepts that are needed to consider multiple conflicting possibilities simultaneously, and therefore rely on what has been called "minimal representation of possibility" (Leahy & Carey, 2020). However, the standard tasks are typically conducted in an individual test context and thereby neglect the pivotal link between higher cognition and hyper-social abilities, such as cooperation and communicative discourse. These are assumed to enhance human reasoning as they tap its social functions (e.g., Mercier & Sperber, 2011; Tomasello, 2014). The current study therefore investigates whether children's failure to represent multiple possibilities in the 3-cups-task can be attributed to performance limitations – the test context in particular – or a lack of modal reasoning competence. To address this question, we embedded the 3-cups-task in a cooperative interaction between the child participants and a second experimenter, and compared children's performance between this social and a standard individual condition with minimal contrast. Data collection is still ongoing (currently n = 96 3-year-olds, final N = 110), but preliminary analyses do not provide clear evidence for the advantages of a social paradigm. Instead, these findings align with minimal representation accounts and have interesting implications for our understanding of the ontogenesis of modal reasoning and the role of social contexts in children's cognitive development.

PC-21 The flexibility of early information-seeking: do infants address their information requests to the best informant available?

Maria Mavridaki, Ágnes-Melinda Kovács
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Infants engage actively with the process of social learning: they display behaviors (social referencing, pointing) that elicit information transfer from adults, and they show selectivity in whom they learn from, preferring competent rather than incompetent partners. However, communicative partners are rarely fully competent or incompetent, but their competence depends on the domain being considered. Here we examine infants' sensitivity to different domains of competence and their ability to flexibly address their information-requests to the best informant. 18-month-olds were presented

with two informants (E1, E2) and exemplars of two novel differently looking object-kinds (O1, O2). During an exposure phase, E1 showed competence in making O1s light up, but incompetence for O2s and E2 showed competence in triggering a sound in O2s, but incompetence for O1s. At test, infants were given O1 and O2 exemplars, which they could not activate. We measured whether they address their help/information-requests selectively to the informant who was competent regarding the respective object-kind. We measured infants' giving actions and looking proportion to the correct informant. Pilot data (N=14) showed a mean giving accuracy of 49% and a mean proportion of looking of 50%, suggesting chance performance. To reduce possible task demands, in the current study we implemented a between-subjects design (N=14). Infants are familiarized with E1 and E2 and their domain of competence and incompetence. At test, however, only one of the informants is present, and the infant is tested either with exemplars of the object-kind that the experimenter knows about (Experimenter-Competent Condition) or does not know about (Experimenter-Incompetent Condition). We measure whether infants display more information-requests in the Experimenter-Competent Condition and explore less the object compared to the Experimenter-Incompetent Condition. The results will shed light on our understanding of the flexibility of early information-seeking with implications for the mechanisms underlying early selective social learning.

PC-22 Maternal Viewing of Own Child Faces: Effects on Visual Information Processing and Executive Function

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The sight of 'cute' infant faces enhances performance in visual search tasks. Two primary theories explain this phenomenon: Nittono et al. (2012) suggest that nurturing motivation enhances attentional selection, while Karreman and Riem (2019) imply an enhancement in executive function. However, previous studies used visual search tasks only, and this study aimed to assess whether viewing infant faces enhance performance of executive function tasks as well visual search tasks. Furthermore, prior studies mainly displaying faces of unrelated children. Considering one's own child is a concrete subject of nurturing, it is plausible nurturing motivation is heightened compared to other children. Thus, the second aim of this study was to validate the impact of displaying participants' own children's images, with a focus on enhancing performance in a visual search task. The study involved 40 mothers of infants aged 24 months or younger. After completing an initial visual search task, participants viewed images of either their own child, another person's child, or an adult. Subsequently, they completed the visual search task again and then engaged in a gambling task. Results show a main effect of session on visual search task accuracy, with post-task scores surpassing pre-task scores. However, no significant interactions or main effects of images were found in either task. In the visual search task, these results differ from prior research, suggesting that the effect of "cute" infant faces on task performances may be weak. Similarly, in the gambling task, there were no main effects of images for the choice decks. Consequently, our study does not discern substantial effects of viewing child faces

on attention and executive function. However, neither theory can be definitively rejected. Further research is necessary to fully understand the complexities of observing one's own child and other children in visual information processing.

PC-23 Unpredictability of Maternal Sensory Signals is Associated with Infant Emotional Reactivity

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Maternal interpersonal adversities, such as childhood maltreatment, which can have adverse effects on future generations. However, the mechanisms behind this intergenerational transmission of maternal CM-exposure are not well understood. The unpredictability of maternal sensory signals has recently been identified as a potential mechanism by which early maternal adverse experiences may impact emotional development in their offspring in western, high-income countries. Yet, the unpredictability of maternal sensory signals has not be tested as a mechanism of intergenerational transmission of maternal CM-exposure in a low-income context, with an increased risk of experiencing interpersonal adversities. This study examines the association between maternal CM-exposure, unpredictability, and infant emotional reactivity in a sample of 120 mother-infant dyads from south-western Uganda, a low-income country. Unpredictability of maternal sensory signals was assessed using an entropy rate, evaluating the predictability of transitions of sensory signals (e.g., auditory, visual, tactile) displayed by the mothers during free play, with their 7-9-month-old infants. Infants' emotional reactivity was assessed during the still face paradigm, and maternal childhood maltreatment was measured using the Childhood Trauma Questionnaire. We observed a high prevalence of maternal CM-exposure (44.2% with moderate to extreme levels of CM). Both maternal CM exposure and unpredictability were independently associated with decreased infant emotional reactivity. Yet, the mediation between maternal CM-exposure and infant emotional reactivity by maternal unpredictability did not reach significance. The current study promotes our understanding of intergenerational transmission pathways of maternal childhood maltreatment, by examining maternal unpredictability as a putative transmission mechanism, on infants' early emotional development. By studying a south-western Ugandan sample, with high prevalence of childhood maltreatment, this study extends the scope to majority world contexts. These context still remain largely understudied, despite heightened need for psychological and psychiatric understanding and intervention.

PC-24 Children's understanding of different types of aspectuality

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Children in their early preschool years are aware of the link between seeing and knowing, for example, they understand that someone "knows X" when they had visual contact with X (Moll & Tomasello, 2006; Wimmer, Hogrefe, & Perner, 1988). Around the age of 4, children also start to understand that these sensory experiences function as the causal origins of knowledge (O'Neill & Gopnik, 1991). Surprisingly, only much later, however, do children seem to fully understand the modality-specific aspects of knowledge, i.e., that different sensory experiences can lead to different types of knowledge. For example, when presented with a task where they had to predict or explain what type of perceptual access leads to a particular kind of knowledge, only 5- to 6-year-olds were able to correctly state that they (and others) needed to see an object to find out its color but feel it to find out its texture (O'Neill et al., 1992). The current project builds on these findings following two aims. First, we are interested in the robustness of the phenomenon under reduced performance demands. We therefore test children between the age of 3 to 5 in a more interactive context, where they themselves have to find out a certain aspect of an object (e.g., its color) and code for their behavior. Additionally, we chose temperature (instead of texture) as the second aspect of the object. Temperature is a more clear-cut case of secondary sensory modality (Bolton, 2022) and presumably more familiar in the everyday life of preschool children (e.g., hot food, cold ice). Second, we want to investigate the relation of this modality-specific type of aspectuality understanding (Perner, 1991) with other forms of aspectuality understanding, i.e., the understanding of the aspectuality of belief (see Rakoczy et al., 2015). The project is currently in the pilot phase.

PC-25 Children's and adults' uncertainty monitoring during referential ambiguity

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When learning novel words, referential ambiguity is a constant part of young children's learning environment. Despite this ambiguity, children seem to infer the referents of novel words with relative ease: e.g., by assuming novel labels to refer to unfamiliar rather than familiar objects, known as the Mutual Exclusivity effect. However, to date, it is unclear whether young children are in some way aware of the different levels of uncertainty involved in referent identification and can effectively use this information.

In a pre-registered project, we assessed preschoolers' (4-5 years) and adults' ability to monitor their uncertainty (implicitly and explicitly) during referential ambiguity and update labels dependent on their initial learning context. To this end, we presented labeling events with different levels

of ambiguity: maximum ambiguity tasks (asking for a novel label in the presence of two novel objects), ME tasks (asking for a novel label in the presence of one novel and one familiar object) and minimum ambiguity tasks (asking for a novel label in presence of one novel object / asking for a familiar label in presence of familiar objects). We then measured participants' explicit assessments of their own uncertainty on a 3-point scale (Hembacher & Ghetti, 2014) as well as different implicit uncertainty indicators. Data collection and coding is ongoing and will be completed by January. Preliminary data (45 children & 19 adults) indicates that both children's and adults' explicit uncertainty systematically increases with the level of ambiguity in the task. Additionally, while adults' data suggests that high levels of uncertainty during initial word-object mappings may increase their willingness to update these links subsequently, this does not seem to be the case for children. The complete pattern of results will contribute to discussions about the mental processes that underlie children's ability to learn words in the face of ambiguity.

PC-26 Children infer the meaning of novel verbs through morphological bootstrapping

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Children are incredibly efficient at detecting and extracting structure from input. Such skills are evident in the efficiency with which children learn language; for example, children in their second year of life already rely on syntactic context to infer the meaning of words, i.e., syntactic bootstrapping. However, this mechanism, which informs current theories on language development, has been originally developed using data from English-learning children, and tested mostly on Indo-European languages. Yet languages vary in how they mark information. We expand syntactic bootstrapping to include morphology - which is lean in English but substantial cross-linguistically. Hebrew-speaking 3- to-4-year-olds (N = 31) viewed dialogues containing novel verbs constructed with familiar morphological templates: two verbs in an intransitive template (hitCaCeC), and in two in a template that tends to be transitive (CiCeC). Each dialogue was followed by a test phase, in which children viewed side-by-side a transitive video (a child performing a novel action on an adult), and an intransitive video (the child performing a novel action alone) - and heard a sentence containing the novel verb. Children looked more than chance towards the transitive video on transitive trials (M = .557 , SD = .099, t(30) = 3.21, p = .003), but not on intransitive trials (M = .522, SD = .083, t(30) = 1.5, p = .143), suggesting they were able to use the transitive but not intransitive template to infer word meaning, consistent with previous results on syntactic bootstrapping, though there was only a marginally sig. difference between the two conditions (t(30) = 1.825 , p = .078). We discuss possible reasons why children might have succeeded only in the transitive condition, despite our design correcting for confounds suggested to explain this effect. We suggest that children rely on distributional information, instead of hard rules, to infer word meaning.

PC-27 Measuring self-regulation skills and prosocial behaviour in preschool – an observational study

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Aims: The aim of our pilot-study was to explore the relationship between prosocial behaviour with unfamiliar adult and different aspects of self-regulation, such as hot and cool executive functions (EF) and emotion regulation. Beside this we wanted to test the adaptability of our observational methods. Method: 15 children participated in our research (Mage: 67, 13 months; SD= 12, 3; min: 48; max: 87; 6 boys). To investigate prosocial behaviour, we used instrumental helping and comforting tasks. To examine self-regulatory skills, we used go/no go task (inhibition, cool EF), resistance to temptation task (hot EF), and a disappointment task (emotion regulation). Results: We used instrumental helping, GO and NO-GO scores as continuous variables, and the outcomes of resistance to temptation and disappointment as dichotomous variable. Outcomes of the comforting task was not used in the analyses, because only 2 children showed this behaviour. Correlation analyses did not show significant connection between helping and inhibition (GO: Spearman's Rho = 0, 210 p = 0, 452; NO-GO: Spearman's Rho = 0, 075 p = 0, 791). We used independent samples T-test to the comparison of children who succeed or failed the resistant to temptation task. They showed no significant difference in helping (Mann-Whitney U = 15,5 p > 0,05). The comparison of children who succeed or failed the disappointment task showed no significant difference in helping (Mann-Whitney U = 15 p > 0,05). Implications: These preliminary results contradict with previous evidence, where connection was found between self-regulatory skills and different forms of prosocial behavior. The small sample size could cause these results too. The findings lead us to further consideration of observational assessment of prosocial behaviour.

PC-28 Children's belief revision strategies in first and third person

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Children have a remarkable capacity for acquiring new information, which at times contradicts their existing beliefs. While research indicates that adults preserve observed data and revise conditional rules when encountering conflicting information, little is known about how young children handle inconsistencies, particularly in first-person and third-person belief revision. To investigate this, in an online study 3 and 5-year-olds watched animations featuring an inverted Y pipe system, having on one side a wide and on the other a narrow pipe. They learned that large balls went through the wide pipe and fell into the box under, while small balls went through the narrow pipe, falling into the box under. During test, a big or small ball was visibly dropped into the pipe with its path obscured, and its final location, signaled only by a sound (one of the boxes made a sound when shaken), could be congruent or incongruent with the established rule.

Children were asked which ball was inside the box, targeting whether their answers would reflect rule or data update in the incongruent cases. In a third-person belief revision scenario, the same events were witnessed through the perspective of a character who, in the test phase, held a false belief about the ball's location, and children were required to update the character's (false) belief. Data suggests that, similarly to adults, in 1st person judgments 5-year-olds (but not younger) tended to revise rules and retain observed data, but only when those rules were not subject to physical constraints (small ball passing through wide pipe). However, interestingly, when revising other agents' beliefs, they revised the rule even when physical constraints were present (big ball passing through narrow pipe). Thus, children seem to manage conflicting information differently depending on various factors: age, physical constraints, kind of belief (1st/3rd person).

PC-29 Past Tense Production and Associative Memory: Testing a Dual Mechanism Model in Williams Syndrome

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This work investigates the applicability of the Words and Rules (WR) theory proposed by Pinker & Ullman (2002) in explaining tense acquisition in individuals with Williams syndrome (WS) and in typical development (TD). The WR theory distinguishes between regular verbs, produced via the grammatical system, and irregular verbs, stored in the lexicon by way of associative memory (AM). While prior research has shown that WS individuals excel in producing regular past tense verbs but are impaired in irregular production (Clahsen & Almazan, 1998), this was explored with a limited WS sample (N = 4). Building on Thomas et al.'s work (2001), our research expands this inquiry to a group of 18 participants with WS (12-44 years, M = 22 years) and 18 TD children matched for mental age (5-7 years, M = 6;3 years). Two tasks were administered: (1) a past tense elicitation task featuring regular and irregular English verbs, and (2) the NEPSY list learning task (Korkman, 1998). Results indicate a 59% accuracy rate for past tense production in WS participants and 60% in TD children, with no significant difference ($\beta = -0.03$, $SE = 0.49$, $p = 0.96$). Both groups primarily produced correct forms for regular verbs and made more errors on irregular verbs ($\beta = 3.63$, $SE = 0.50$, $p < 0.001$). Surprisingly, TD participants made more errors on irregular verbs compared to participants with WS ($\beta = -2.01$, $SE = 0.46$, $p < 0.001$). Notably, higher AM scores predicted better overall performance on the past tense task ($\beta = -0.29$, $SE = 0.08$, $p < 0.001$). Our findings diverge from the WR dissociation hypothesis on two fronts. First, TD individuals committed more errors than WS individuals on irregulars. Second, our data suggest that AM contributes to the acquisition of both verb types in both groups.

PC-30 The effect of emotions on counterfactual thinking

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Counterfactual thinking (CFT) refers to mental processes which simulate a reality that is counterfactual to the real world. Classic examples for these kinds of thoughts are "what-if" scenarios. CFT has been shown to be closely related to causal thinking and Theory of Mind, but also to emotional evaluation of events. Recent studies found that children perform better at CFT-tasks if these were connected to negative emotions (Nakamichi, 2019). Building on paradigms used by Nakamichi (2019) and Rafetseder & Perner (2018) we examined in this study whether this effect of emotions on CFT shows only in connection to negative emotions or if positive emotions have a similar effect. Therefore, we presented 5 to 7-year-old children (n=52) with three similar stories, which only differed in the emotion condition, and a following CFT-task related to the events in the story. Although the results showed no statistically significant differences between the emotion conditions and the neutral condition, which was set as baseline, we observed strong tendencies regarding the influence from both negative and positive emotions on CFT, which suggest that further studies regarding this correlation could be fruitful.

PC-31 Causes and correlations in the developmental link between language and mindreading

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This paper makes a theoretical contribution. It proposes a developmental link between language and theory of mind – language-theory of mind link. It puts forward two contrasting ways of interpreting this link. One reads the link as causal. On this reading, language development contributes to the development of theory of mind, so that theory of mind could not develop normally had it not been for language. The other reads the link as correlational. This is the very influential pragmatic view. On this reading language development merely contributes to task performance, and not theory of mind development itself, because language helps the child to correctly interpret the experimenter's question in the context of a theory of mind task. The pragmatic view proposes a number of biases that govern the child's inferences in standard theory of mind tasks. While these biases do sometimes affect the child's task performance, their impact is not substantial enough to support a purely correlational reading. This is so for two reasons. First, sometimes subjects' development in verbal and non-verbal tasks is mirrored, indicating only a small role for pragmatic factors. Second, some experiments avoid pragmatic factors entirely but still show major developmental effects from language. For this reason, we ought to prefer a causal interpretation of the language-theory of mind link. In conclusion, this work highlights the presence of a developmental link between language and

theory of mind and underscores its causal nature, shedding light on the intricate relationship between linguistic development and theory of mind development.

PC-32 Cognitive-linguistic profiles underlying reading difficulties in Hebrew

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While many researchers now widely support a multiple cognitive deficit model of reading difficulties, different cognitive-linguistic deficits may manifest differently in reading development, depending on the characteristics of the writing system and the language it encodes. The current study examined the cognitive-linguistic mechanism underlying reading difficulties in Semitic Hebrew, characterized by a rich and complex morphology, and includes a single system with two writing versions that differ in phonological transparency—a shallow-pointed version and a deep-unpointed version. A two-step cluster analysis was used to group 96 second graders and 81 fourth graders according to their phonological awareness (PA), rapid automatized naming (RAN), orthographic knowledge (OK), and morphological pattern identification (MPI) abilities. Reading accuracy and fluency measures in both writing versions were also examined. The cluster analysis revealed that the PA deficit was combined with poor MPI in the second grade (20%) and with MPI and OK deficits in the fourth grade (15%); The RAN deficit was combined with poor OK in the second grade (20%), while in the fourth grade, two distinct profiles were found, one with a RAN deficit (12%) and the other with an OK deficit (20%). The analyses further showed differences in the importance of impairment in each of the cognitive-linguistic components, depending on the developmental stage, orthography transparency, and reading-task type. The findings support a hybrid perspective for understanding the heterogeneity of RD development and highlight how the relevance of impairment in the cognitive-linguistic system that supports reading development varies according to the unique characteristics of the Hebrew language and writing system.

PC-33 Automatic Imitation in School-Aged Children

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Humans strive to be part of a group. By imitating others, we can affiliate with them, promote prosocial behaviour, and benefit from what others have already learnt. So far, imitation has been measured using diverging methods in children and adults. Here, we investigated whether school-aged children's imitation can be measured via automatic imitation with a classical imitation-inhibition task (Brass et al., 2000) as used in adults. In these tasks, participants execute finger movements in response to observed congruent or incongruent finger movements or symbolic cues. Participants typically respond faster and with fewer errors when presented with congruent than incongruent movements,

indicating automatic imitation. We measured automatic imitation in N = 94 seven- to eight-year-olds and N = 10 adults. Furthermore, we explored whether the perceived similarity of the participating children with the model influences their automatic imitation. The results were similar in children and adults: Observing movements that are incongruent with participants' movements interferes with their responses resulting in increased reaction times and error rates (Figure 1). However, even though the similarity manipulation seemed to have worked in that children perceived the similar model to be more similar than the dissimilar model, we did not find support for an effect of perceived similarity on children's automatic imitation. The study shows that assessing automatic imitation via the imitation-inhibition task is feasible in children and creates the basis for future studies to compare the behaviour of different age groups with the same imitation task.

PC-34 How primary is factive Theory of Mind? Reaction time studies on knowledge vs. belief ascription

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In the realm of cognitive science, the standard assumption has been that attributing belief is primary. However, this notion has recently been challenged by factive Theory of Mind accounts, which propose that ascribing knowledge is primary and prior to belief attribution. One compelling piece of evidence comes from reaction time studies where participants were tasked with evaluating the truth or falsity of statements related to a character's knowledge or belief after reading a vignette. Interestingly, the results revealed that participants were notably quicker in assessing knowledge as opposed to belief attributions. This finding could suggest that the process of full-fledged knowledge ascription may be independent of, faster than, and thus considered primary in comparison to belief ascription. Contrary there might be a more fundamental form of ascribing factive mental states, which has long been posited in the Theory of Mind literature as primary. However, this primary form may not equate to full-fledged knowledge ascription, given that one crucial aspect of propositional attitudes like knowledge is their aspectuality. Perhaps subjects can evaluate knowledge questions faster as long as these do not involve considerations of aspectuality. If, however, knowledge ascription questions were to raise issues of aspectuality, the ascription of full-fledged propositional attitude concepts like knowledge proper would be required. To test this hypothesis, that the reaction time to evaluate knowledge and belief varies based on the type of knowledge under question, we followed up on and extended previous reaction time methods. Results showed a significant interaction between knowledge type (non-aspectual vs. aspectual) and ascription type (knowledge vs. belief). Particularly, participants were significantly faster in ascribing knowledge compared to belief in non-aspectual but not in the aspectual knowledge condition. In light of these findings, we are planning to conduct a follow-up study considering the potential pragmatics.

PC-35 Estimation of the Temporal Integration Window from early infancy to adulthood

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Perception is a fundamental aspect of human cognition that organizes sensory input into coherent events. This process involves discrete sampling of the environment: when successive stimuli are presented closely in time, within a “”temporal integration window”” (TIW), they are integrated; but if the stimuli are separated by longer delays, belonging to two successive TIWs, they are perceived as two distinct events.

In this study, we aimed at estimating the duration of the TIW across development from early infancy to adulthood. We designed a visual search task where participants saw sequences of 2 alternating displays separated by variable stimulus onset asynchrony (SOA). In integration trials, only half-faces were presented, but a whole face could be seen and attract attention if the two displays were integrated into one unique percept. In contrast, in segmentation trials, the integration of the two displays lead to the perception of multiple faces, whereas only one whole face was actually drawn on the screen and visible if the two displays were perceived as two distinct events. Shorter SOAs should thus increase the detectability of integration targets and longer SOAs should increase the detectability of segmentation targets. We estimated participants’ TIW by identifying the crossover point on performance curves for integration and segmentation trials within each age group. Our results demonstrated a shrinking of the TIW along development, with a TIW over 400ms in 5-months-olds (N=48), between 250ms and 400ms in 8-month-olds (N=48), 83ms in 3-year-olds and 66ms in 5-year-olds (N=24) and adults (N=24). These findings shed light on the acceleration of perception sampling throughout development. The speed of perception appears adult-like around 5 years of age. In contrast, in 5-month-olds, perception appears at least six times slower. Potential consequences of slow perception in early developmental stages and links to developmental disorders will be discussed.

PC-36 When cooperative motives lead to uncooperative behavior: Children cheat to return favors

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Reciprocity, the practice to exchange favors over time, is a key mechanism supporting cooperation. Children not only reciprocate prosocial acts from early on but also view reciprocity as obligatory, a tendency thought to be central for cultivating mutually beneficial cooperative enterprises. What has largely been overlooked, however, is that reciprocal motives can also encourage ethically questionable behaviors (e.g., when a politician returns favors to campaign donors at the expense of their constituents). The extent to which young children are willing to break rules to reciprocate favors has not been explored. In two preregistered studies, we investigated how children evaluate

others' reciprocally motivated transgressions (Study 1) and whether children themselves transgress to benefit previous benefactors (Study 2). In Study 1, 5- to 8-year-olds (n = 48) were presented with vignettes depicting protagonists who had the opportunity to benefit others by cheating in a game. Children of all ages advised the protagonist to refrain from cheating and evaluated cheating negatively, regardless of whether the beneficiary had previously benefited the protagonist. In a third-party context, children thus condemned cheating and prioritized rule adherence over returning favors. In Study 2 (n = 92), 7- to 8-year-olds first interacted with a social partner who either donated a valued resource to the child (reciprocity condition) or behaved neutrally (control condition). Subsequently, children themselves had the opportunity to cheat to benefit the partner. Children cheated significantly more in the reciprocity condition than in the control condition, and this tendency grew with trial number as children's indebtedness to the partner increased. In a first-party context, children were thus willing to flout rules they otherwise condone in favor of reciprocating prosocial acts. These findings suggest that cooperative motives that are widely viewed as foundational for human flourishing can also be implicated in the erosion of societal norms.

PC-38 Maternal Questions and Pointing Gestures and Their Relation to Infants' Vocabulary Development: A Longitudinal Study

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Research shows that different features of early maternal input, particularly questions, contribute to children's vocabulary development. The current study examined how (i) mothers' questions with and without pointing differed when infants were 8 and 14 months old, (ii) mothers' questions differed across low- and high-SES backgrounds, and (iii) mothers' questions contribute to infants' vocabulary. We observed 31 Turkish-speaking mother-infant dyads from low- and high-SES backgrounds when the infants were 8 and 14 months old during the decorated room paradigm; in which they spent 5 minutes in a room with objects hung on the walls. We coded question types as Why/How, Yes/No, Wh- (What, Where, Who), and Tag, and we coded question content as: Referential (Label and Location), Description, and Action/Behavior. We also coded whether questions with different content were accompanied with pointing or not. We assessed infants' receptive vocabulary using the Turkish Communicative Development Inventory I (TCDI-I) at 14 months and expressive vocabulary using TCDI-II at 18 months. Confirming earlier findings, mothers mostly asked wh- and yes/no questions, and wh- question frequency increased with age ($p=.05$). The content of maternal questions differed by infants' age but not by SES. Mothers' location and action/behavior questions increased with infants' age ($p=.011$ and .007, respectively). As for the content, label was the most common, followed by location. Overall, mothers' questions without pointing were more frequent than questions with pointing ($p<.001$). Hierarchical regression analyses showed that mothers' description questions with pointing at 8 months predicted infants' receptive vocabulary at 14 months ($\beta=.390$, $p=.037$). Moreover, mothers' label questions without pointing at 14 months predicted infants' expressive vocabulary at 18 months

(β=.482, p=.035). These findings highlight the importance of maternal input (verbal and non-verbal) for children's vocabulary, even as early as 14 months.

PC-39 EEG Alpha Asymmetries as Predictors of Explicit False Belief Understanding in Children Aged Three to Four Years

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False belief understanding (FBU) is a fundamental aspect of Theory of Mind (ToM). EEG alpha asymmetry is a notable indicator of socio-cognition. Sabbagh & Flynn (2006) linked mid-frontal(F4-F3) asymmetry to mental-state decoding in adults. However, little investigation focused on the association between alpha asymmetry and FBU in toddlers. Considering the substantial FBU development at 3-4-year-olds and resting EEG as a reliable indicator of cortical maturation, investigating the correlation between alpha asymmetry and behavioral FBU within the relevant age range facilitates our understanding of ToM.

The longitudinal study tested children at Time1 (N = 53, M = 34.24 months, SD = 1.50) and Time2 (N = 36, M = 52.23 months, SD = 0.44). Resting-state EEG were gathered from T1, and explicit FBU tasks were conducted at both time points. Alpha asymmetries were calculated by subtracting the natural logarithm power of the left hemisphere from that of the right hemisphere. The regions of interest largely aligned with previous studies. We conducted correlation and regression between the alpha asymmetry at T1 and behavioral FBU at both time points. A noteworthy correlation emerged between alpha asymmetry (frontocentral, centroparietal) and explicit FBU. This relationship remained significant controlling for confounding variables (i.e., general intelligence, language skill, executive function). Additionally, a linear regression indicated superior explicit FBU associated with heightened activities in the right hemisphere (T1: CP2-CP1, t = -2.757, p = .009; T2: F4-F3, t = -3.475, p = .004).

We found a preliminary link between alpha asymmetry in the frontal and centroparietal regions and explicit FBU between ages 3 and 4 years. However, Sabbagh's research suggests that mental-state decoding is associated with frontal asymmetry. This suggests that frontal activity may share neural basis for mental-state decoding and FBU, regardless of adults or toddlers, while centroparietal alpha asymmetry seems uniquely tied to FBU in toddlers.

PC-40 The emergence of sensitivity to normative expectations in British and Ugandan children

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Social norms are thought to be an important motivator of human prosociality, but our understanding of how sensitivity to norms develops, particularly in diverse cultural settings, is limited. We follow social norms by attending to our beliefs about what other people approve of (i.e. normative expectations), and then trying to avoid eliciting others' disapproval. In practical terms, this means that we ought to be more likely to act in a self-interested manner when doing so will not violate others' expectations that we should be prosocial. This could happen (i) when others don't seem to want us to act in any particular way, or (ii) when others want us to be prosocial but are not observing what we do. Although prior research on reputation suggests that children are becoming more sensitive to observation around age 5, we still know little about how this interacts with children's explicit understanding of what others approve of, despite this being a critical aspect of normative behaviour. The current study employs a novel sharing paradigm which explores sensitivity to normative expectations in 4.5 year-old children from the UK and Uganda. The within-subjects paradigm comprises four modified conditions of a Dictator Game, in which children are allowed to divide a set of 9 rewards between themselves and a peer in any way they like. Across these four conditions we employ a 2x2 design in which we vary both (i) the experimenter's approval of sharing generously, and (ii) whether the participant is observed by that experimenter. Results indicate a cultural difference, with Ugandan children displaying sensitivity to normative expectations, unlike children from the UK. Plausible explanations for this cultural difference relate to cultural sharing norms, parenting and socialisation practices and cultural tightness-looseness.

PC-41 Sleep patterns and language development in infancy: a preliminary study

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Sleep plays a crucial role in the first years of life. Recent evidence showed how important sleep is for memory (Friedrich et al., 2020), language development (Knowland et al., 2022), and executive functions (Gliga et al., 2023). However, the links between sleep and cognition during development are still unclear. This contribution aims at investigating the concurrent validity of multiple methods to assess linguistic skills and sleep patterns and their relationship.

A group of 26 children between 6-and-19-months was involved. The number of vocalizations (CVC), of produced-comprehended words, and gestures were measured though the LENA device and the Italian version of the MB-CDI. The mean time of night sleep and number of daily naps were

measured using MotionWatch together with a sleep diary and the Sleep Disturbance Scale for Children. Concurrent validity. A positive relationship was found between the CVC in LENA and the number of words produced according to the MB-CDI (rho= .433, p= .027). A significant relationship emerged between the time of night sleep reported in the sleep diary and the time recorded by MotionWatch (rho=.512, p=.008). Furthermore, day naps reported in the sleep questionnaire correlates with the day naps reported in the sleep diary (rho=.583, p=.004). The relationship between sleep and language. Two sub-groups were then created based on the presence or absence of adult-like productions as reported by parents in the MB-CDI questionnaire: the preverbal group (MAGE=10 months) and the verbal group (MAGE=16 months). For the preverbal group we found that, the more frequently they nap during the day, the less mature they are in their communicative skills (p<.05). For the verbal group, the time children sleep at night negatively correlates with the vocabulary size (rho=-.695, p=.038). These preliminary findings suggest that the development of communicative skills might be influenced by sleep patterns.

PC-42 Pupil responses reveal an altercentric bias in 9- but not 18-months-olds' object location memory

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In previous studies, infants younger than 2 years have demonstrated correct expectations of how an agent with a false belief will act. However, the reliability of these findings and the underlying mechanism continue to be a topic of debate. The altercentric theory posits that infants' own representation of the world is strongly influenced by the perspectives of others. Specifically, infants may remember the location of objects based on where others have seen them, thus allowing them to predict where others will search for the object later on. Here, we set out to investigate whether infants' object location memory is spontaneously modulated by an agent's false belief. In a preregistered eye-tracking experiment, we showed infants aged 9- and 18-months (total N=169, Bayesian sequential testing) video scenarios in which an agent observed an object moving to one of two possible locations. Subsequently, she witnessed (True Belief) or did not witness (False Belief) the object's change in location. In the object memory block of the experiment, the object either reappeared from the reality congruent or incongruent location. In the action anticipation block, the agent searched for the object in the congruent or incongruent location. We predicted that infants' expectation of the objects' location would be modulated altercentrically, meaning that infants represent the object's position based on the agent's belief. Indeed, our results showed that younger infants' (N=90) showed greater pupil dilation when observing the object reappearing from its actual location, whereas older infants (N=79) showed the opposite pattern with greater pupil dilation to outcomes violating reality. Consistent with recent findings, this indicates that infants may have an early but receding altercentric bias. This memory bias, however, did not predict correct action expectations when the agents' action was shown as outcome. We discuss these findings in relation with the development of infants' self-concept.

PC-43 Music in the Brain : Neuroimaging of the effects of the educational program: "Un violon dans mon école"

Théo Morfoisse, Séverine Becuwe, Marie Palu, Cassandra Potier-Watkins, Ghislaine Dehaene-Lambertz, Stanislas Dehaene

Cognitive Neuroimaging unit, Inserm, CEA, Université Paris Saclay, NeuroSpin Center

Music, along with other highly abstracted domains such as mathematics or language, appears to be deeply rooted in our humanity. Indeed, human's brains seem to be able to understand and appreciate it from an early age, just as conversely, the practice of music profoundly shapes its anatomy and functioning. If numerous studies have suggested that learning a music instrument modifies positively the child's brain, the impact of music on non-musical and far domains is still very debated in the scientific community. To shed light on these debates, we carried out behavioral and brain imaging experiments (MEG, fMRI) with children from the French program Un Violon dans mon école. Half of the children in this program received weekly violin classes during school time, from the middle section of kindergarten to second grade, while the other half did not receive such apprenticeships, but are demographically and socio-economically matched to the violin children. 53 children, including 32 from the violin schools and 21 from the control schools, performed brain imaging experiments (both MEG and fMRI) at the beginning of first grade, and at the beginning of second grade. These experiments enable us to understand in greater detail the processes of cerebral plasticity generated by the practice of music, and more specifically to its impact to other brain circuits than those directly involved in music. Based on its high spatial resolution, we used functional MRI to evaluate the influence of active music practice on the networks of spoken language, mathematics, and theory of mind. On the other hand, we used the high temporal resolution of the MEG to finely measure the attention and inhibition capacities of these children, as well as their phonological awareness.

PC-44 Does the instruction manipulating the use of strategies and pedagogical questions affect 5-year-olds' persistence?

Moeko Ishikawa, Yasuhiro Kanakogi

Osaka University

Persistence predicts children's future academic achievement; therefore, researchers have focused on ways to enhance persistence. In the current study, we investigated the factors that affect 5-year-olds' persistence using a challenging wooden box task (Leonard et al., 2020) by manipulating instructions. We manipulated the use of strategies; children were either told to focus on one strategy (i.e., shaking) or multiple strategies as a previous study showed that children who used multiple strategies to open the box during the persistence task worked on the task longer (Ishikawa et al., 2023). In addition, we manipulated the pedagogical questions, i.e., questions that are asked by a person who already knows the answer and are intended to help the questionee learn (Yu et al., 2019). This facilitated exploration in preschoolers. We hypothesized that, when children are instructed to focus on multiple

strategies and are instructed in a pedagogical manner, they are likely to persist in the task longer. Preschoolers (N = 150, girls = 65, mean age = 58.53±3.47 months, range = 52–66 months) participated in this pre-registered experiment (https://osf.io/krfep) including five conditions. To examine the effects of strategies, pedagogical questions, and their interaction on persistence, we performed multiple regression analysis among the four conditions without baseline and planned follow-up comparisons of each condition with baseline. We found a trend toward strategies ($F(1, 116) = 3.77$, $p = .054$), but no effect of pedagogical questions ($F(1, 116) = .28$, $p = .60$) or interactions ($F(1, 116) = .52$, $p = .47$) on persistence. These findings indicate that the use of strategies and pedagogical questions did not affect the children's persistence. Therefore, we discuss the reasons that these instructions were not effective on children's persistence as well as directions for future studies.

PC-45 Understanding of the functions of forgiveness among preschoolers

Rizu Toda, Nazu Toda, Hiromichi Hagihara, Yasuhiro Kanakogi
Osaka University

Forgiveness is a key to restoring and maintaining cooperative relationships, allowing us to keep benefitting from these relationships. Previous studies indicated children as young as 4-year-old could forgive transgressors, both as a third party and as a victim. However, little is known about how young children understand the functions of forgiveness. This study focuses on the two main functions of forgiveness–the restoration of a damaged relationship between the victim and the transgressor and the positive change in the victim's originally negative feelings toward the transgressor. Four-year-olds (N = 48), five-year-olds (N = 50) and six-year-olds (N = 50) in Japan heard stories in which a victim either forgave (Forgiving story) or did not forgive (Rejecting story) a transgressor, and answered questions regarding (1) the relationship between the victim and the transgressor and (2) the victim's emotions toward the transgressor. Regarding the relational changes, children in all age groups expected that the relationship between the victim and the transgressor would be restored in the Forgiving story. However, only six-year-olds understood that the relationship would remain damaged in the Rejecting story, where the victim did not show forgiveness. Similarly, for the emotional changes, six-year-olds understood that the victim would experience positive emotional change toward the transgressor only in the Forgiving story, but not in the Rejecting story. Contrarily, four- and five-year-olds expected the victim to have positive emotional change regardless of whether the victim showed forgiveness or not. Taken together, the understanding of the two main functions of forgiveness develops during preschool years, and by the age of 6, children come to be proficient in understanding these functions. Children may acquire the understanding of unforgiveness later than that of forgiveness. Understanding the functions of forgiveness may contribute to regulating social relationships among young children.

PC-46 Epistemic modality encodes reasoning effort

Valerie Wurm

Humboldt University Berlin

It is uncontroversial that epistemic modals (ENMs) like English `must' involve some inferential process: intuitively, a statement of the form `must'-φ indicates that the speaker has concluded φ from a set of salient premises. While this intuition is omnipresent in semantic accounts of ENMs, it is rarely taken up in the actual analysis. Instead, the seemingly inferential component is often attributed to other requirements (indirect evidence; weakness; the presence of an argument), and the exact relation to inference not spelled out satisfactorily.

In order to fill this gap, in, I develop the hypothesis that the main semantic function of ENMs is indicating deliberate reasoning exceeding some minimal level of complexity. In this talk, I extend this hypothesis to epistemic possibility modals and, in turn, demarcate other epistemic expressions. Furthermore, I connect my idea to insights regarding the acquisition of epistemic expressions, which are usually taken to be acquired relatively late ('epistemic gap', see for an overview). It will turn out that my account is in line with the assumption by that only a subset of epistemic modal expressions are acquired late, namely those that require metacognition. Furthermore, I present an outline of an experiment testing my hypotheses, answering questions like: 1) Can we confirm that reasoning complexity is involved in the licensing of epistemic modals? 2) What about other types of complexity, e.g. linguistic complexity or, generally, cognitive load? 3) Is there a difference wrt. the sensitivity to reasoning complexity within the set of epistemic expressions? If this idea is on the right track, apart from capturing the distribution of epistemic modals more comprehensively than other accounts,it moreover makes the rather profound claim that natural language encodes reasoning effort.

PC-47 Testing 12-month-old infants' evaluation of expected information gain in a gaze-contingent paradigm

Bálint Varga[1], Gergely Csibra[1], Barbara Pomiechowska[2], Ágnes Melinda Kovács[1]

[1]Central European University; [2]University of Birmingham

Although there is a growing body of research on how infants' observational behavior may be sensitive to the information they gained in the past, it is unclear if their behavior is also directed by forward-looking evaluation of information, such as expected information gain. In an eye-tracking paradigm, we investigated 12-month-olds' ability to actively use information sources by controlling on-screen events with their gaze. In each trial, participants were presented with three closed boxes, each potentially containing a character. By fixating on two laterally positioned buttons, infants could ""shake"" two different, partially overlapping pairs of boxes, thereby gathering auditory cues about these boxes' possible contents before they were opened. We hypothesized that infants would shake box pairs in line with maximizing information gain about character locations.

We ran two experiments with different underlying probability distributions for character locations. In experiment 1 (N=36), the distribution was uniform, making all box pairs equally informative until the last six trials, when one of the boxes was initially revealed to be empty, rendering one box pair suddenly more informative. Infants showed a significant increase in decision onset time and likelihood of anticipations across trials, suggesting that they learned the task-relevant contingencies. However, contrary to our hypothesis, participants were significantly more likely to choose the uninformative button. These results do not align with maximizing expected information gain, but they are congruent with maximizing the probability of auditory cues and confirmatory hypothesis testing. Experiment 2 employs a non-uniform probability distribution for character locations to differentiate between these strategies. In this setup, one box pair becomes consistently more informative about the current character location before any box is eliminated, while the other provides confirmatory evidence. Data collection is in progress and results will be presented at the conference.

PC-48 Norwegian preschool staff's child-rearing values and behaviors in relation to children's Theory of Mind understanding

Vårinn Hauan Nilsen, Gabriella Óturai, Monika Abels
UiT The Arctic University of Norway

The relation between child-rearing practices and children's Theory of Mind development has been studied (Devine & Hughes, 2018). Previous research has found a relation between caregivers' child-rearing values and behaviors, and children's outcomes (Devine & Hughes, 2018; Licata et al., 2016; Ruffman et al., 2002) such as Theory of Mind (ToM), which is the understanding of one's own and other people's mental states (Wellman & Liu, 2004). Norwegian preschool children spend a large amount of their everyday life with preschool staff as their caregivers (Statistisk sentralbyrå, Barnehager, n.d). However, only a few previous studies have investigated this relation with the preschool staff as the child's caregiver (Lopez et al., 2022; Mulvihill et al., 2023; Wu et al., 2021). The aim of the research project is therefore to investigate preschool staff`s child-rearing values and behaviors, in relation to children's ToM understanding. Participants will be preschool children aged 3 to 6 years and preschool staff normally working with these children. We will observe preschool staff's use of mental state talk during two different everyday situations (wordless book "reading" and dressing for outdoor time), measure children's ToM using a digitalized Norwegian version of Wellman & Liu`s (2004) ToM scale, and ask preschool staff to fill out a questionnaire about their child-rearing values and background. We expect that caregivers' child-rearing values are related to their mental state talk which in turn is positively related to children's ToM understanding. Data collection is planned with 40 children at Norwegian preschools, in the fall of 2023, which may give the possibility of presenting preliminary results at the conference.

PC-49 Unleashing Creative Potential: Investigating the Influence of Emotional State Fluctuations

Jue Wang, Yusuke Moriguchi
Kyoto University

This study examines the influence of emotional states on children's creative thinking. While previous research has explored this relationship in adults, its applicability to children remains unclear. To address this gap, we employed child-friendly emotion induction techniques using game-like virtual environments (VEs). A total of 121 children aged 7 to 9 years participated, reporting their emotional states and completing a standard creative thinking task after exposure to positive, negative, or neutral VEs. Our findings indicated that while both positive and negative emotional VEs successfully elicited relevant emotional reactions in the children, the VEs did not directly impact the children's creative performance. Noteworthy is the correlation we observed between changes in emotional states during VE exposure and the subsequent creative performance of the children. Specifically, children who experienced negative or deactivated emotional states exhibited enhanced performance in generating original creative ideas.
These results offer initial evidence that changes in children's emotional states can indeed influence their creative performance. Interestingly, our findings deviate from previous studies in adults, which associated increased positive affect with higher creativity. This suggests that the influence of emotional states on creativity may vary across development stages. In adults, positive emotions may enhance creativity by broadening attention, whereas in children, negative emotions could motivate the search for more enjoyable and innovative alternatives.

PC-50 The Effects of Experiencing Social Exclusion on Hostile Thoughts in Young Children

Nozomi Yamamoto, Yusuke Moriguchi
Kyoto University

While experiencing social exclusion increases the tendency to interpret ambiguous stimuli as hostile in adults (e.g., DeWall et al., 2009), such impact on children remains unclear. Our study aimed to investigate whether 4-to-6-year-old preschool children tend to interpret ambiguous stimuli as hostile after experiencing exclusion and whether such tendency develops with age. We developed a ball-tossing paradigm for children based on previous studies (e.g., Hwang & Markson, 2020). In this ongoing study, 44 children (Mage in months=63.89, range=53-75; 22 females) were randomly assigned to either inclusion (n=21) or exclusion (n=23) conditions. In the inclusion condition, children received the ball 7 times out of 20 tosses. In the exclusion condition, children received the ball 3 times out of 20 tosses. After the game, children reported (1) the amount of the ball they received (0 as "none" to 3 as "many"), (2) whether the players were nice or mean (0 as "nice", 1 as "mean"), and (3) whether the ambiguous intentions causing negative outcomes are hostile or not (four scenarios; 0 as

zero times, 4 as four times of hostile interpretation). As the results, first, excluded children reported fewer balls receiving (M=1.74, SD=0.61) than the included children (M=2.48, SD=0.59). Second, older children in the exclusion condition (Mage in months=69.68, range=64-75) rated the players as meaner (M=0.29, SD=0.38) than the inclusion condition (M=0.15, SD=0.23), whereas younger children (Mage in months=58.09, range=53-63) did not differ between the conditions (M=0.14, SD=0.22 for both conditions). Third, older children in the exclusion condition interpreted ambiguous intentions as hostile more often (M=3.00, SD=1.00) than the inclusion condition (M=2.70, SD=1.27), whereas younger children did not (M=2.64, SD=1.43 for exclusion, M=3.09, SD=1.24 for inclusion condition). These results suggest that the effect of social exclusion on hostile thoughts might differ throughout the development.

PC-51 Epistemic Talk as a Tool for Sensitive Scaffolding in Mother-Child Story Narrations: Does children's age and their level of knowledge matter?

Nihal Yıldız Gökçe, Elif Bürümlü-Kisa, Hande Ilgaz
Bilkent University

A sizable literature document that parents' focus on the mental world of stories supports children's developing understanding of the mind (e.g., Devine & Hughes, 2018; Tompkins et al., 2018). The current study conceptualizes epistemic talk (i.e., cognitive, certainty, contrastive) as a type of scaffolding that adults use (e.g., Fernyhough, 2008). Consequently, we investigated whether mothers appropriate their epistemic language according to their children's knowledge (first vs. second time hearing the story) and abilities (i.e., age). To test this, 126 Turkish-speaking parents and their preschoolers narrated a wordless storybook. One week later, 120 of these mother-child dyads re-narrated the same storybook. Mothers' language was coded for epistemic expressions (i.e., cognitive, certainty, contrastive) at lexical and morpho-syntactic levels with the referents (i.e., 1st, 2nd, 3rd person). Mothers produced shorter narratives in their second telling of the story. Hence, all analyses used proportion values by the number of clauses to control for story length. Concordant with the idea of epistemic language as scaffolding, the use of epistemic expressions varied according to child characteristics (i.e., age, knowledge of the story). Mothers' use of epistemic expressions decreased from their first to second narration. Importantly, mothers made more epistemic references to themselves and their children in their first narrations as compared to their second. Mothers of 3- and 4-year-olds used more certainty words than mothers of 5-year-olds. In addition, mothers of 4-year-olds used more contrastives than mothers of 3-year-olds. In both sessions, mothers used a higher proportion of cognitive expressions followed by certainty expressions and contrastives. The results will be discussed in the light of a sociocultural perspective on the relationship between mothers' epistemic talk and children's social understanding.

PC-52 In search for information: Investigating the role of instruction type and mode of information delivery in preschoolers' exploration

Rebeka Anna Zsoldos, Ildikó Király
Eötvös Loránd University

Research revealed that pedagogical instruction following demonstration limits the exploratory play of children. This study investigates whether the limiting effect of pedagogical instructions is independent of who generated the evidence: the child or the teacher. We cross two factors, the type of instruction children receive from the adult (pedagogical/non-pedagogical) and the mode of information delivery (discovered by the child/demonstrated by the adult), and measure how preschool-age children (n = 148, range: 48 – 72 months) explore a toy with multiple affordances. When pedagogy has an effect, limited exploration is expected. The results indicate that pedagogical instruction limits exploration and directs children to exploit the target affordance irrespective of who delivered the evidence.

PC-53 Investigating children's (6-11) connection to nature at the Natural History Museum of London

Zsuzsa Lugosi, Jill Hohenstein, Heather King
King's College London

Increasing awareness on environmental issues, such as biodiversity loss and climate change, has led to growing scientific interest in humans' perceptions and feelings about nature. Nature connectedness, the emotional and experiential bond people can develop with the natural world, emerged from such research as a key factor and indicated that a stronger connection to nature did not only benefit humans (improved mental and physical wellbeing) but also the planet (increased pro-environmental behaviours, e.g. in Giusti, 2019). While children are often expected to grow up to be environmentally conscious citizens, this process is mostly encouraged through formal and informal environmental education often placed in outdoor settings. The existing research on nature connectedness however suggests that improving connection may not be effectively achieved by knowledge accumulation alone and experiences that promote emotional reactions may be more successful (Chawla, 2020). To date little research examined the potential natural history museums may have to connect their younger visitors to nature. The aims of our research it two-fold: first we aim to determine the extent to which the Natural History Museum of London (NHM) promotes a stronger connection to nature, secondly, we used two different tools to determine whether these are suitable tools to measure nature connectedness in the museum. Using the Implicit Association Test (IAT, Nosek et al., 2007) and the Nature Connection Index (NCI, Richardson et al., 2019) we collected data from children aged 6-11 (N=70) as they entered (pre) and as they left (post) the museum. Initial analysis suggests that children's connection to nature increased during their visit when measured with the NCI ($t(69)=4.0$, $p<.001$, $M_{pre}=60.3$, $SD=22.1$, $M_{post}=65.6$, $SD=21.7$), but not when measured with the IAT ($t=(69)=1.11$, $p=0.271$, $M_{pre}=0.295$, $SD=0.442$, $M_{post}=0.237$, $SD=0.431$). Data collection is still ongoing but further explorations of the data and initial conclusions will be included in the presentation.

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DEVELOPMENT

RESTAURANTS AND MAPS

FOOD PLACES AROUND CEU

1. HUMMUSBAR €
Október 6. u. 19, 1051 Budapest
Middle Eastern, Street Food, Vegetarian-Friendly

2. PASTA CULTURE €
Október 6. u. 19, 1051 Budapest
Soups, Sandwiches, Pasta, Pizza

3. ISTANBUL KEBAB €
Október 6. u. 22, 1051 Budapest
Self-service, Fast food

4. DELIBABA €€
Nádor u. 19, 1051 Budapest
Soups & Sandwiches, Vegetarian-Friendly

5. BÖRZE €€-€€€
Nádor u. 23, 1051 Budapest
Hungarian

6. HILDA €€-€€€
Nádor u. 5, 1051 Budapest
Farm-to-table

7. TERV PRESSZÓ €€
Nádor u. 19, 1051 Budapest
Hungarian

8. TRATTORIA POMO D'ORO €€-€€€
Arany János u. 9, 1051 Budapest
Italian

9. RETEK BISZTRÓ €€
Nádor u. 5, 1051 Budapest
Hungarian cuisine

10. BIG FISH €€-€€€
Zrínyi u. 2, 1051 Budapest
Farm-to-Table

11. BAMBA MARHA €
Október 6. u. 6, 1051 Budapest
Burger Bar

12. PAD THAI WOKBAR €€
Október 6. u. 4, 1051 Budapest
Asian, Fast food

13. PIZZA ME €€
Sas u. 10, 1051 Budapest
Fast Food

14. FRUCCOLA €€
(Temporarily Closed)
Arany János u. 32, 1051 Budapest
Soups & Sandwiches

15. RETRO LANGOS €-€€
Bajcsy-Zsilinszky út 25, 1065 Bp.
Hungarian Street Food

16. ARTIZÁN BAKERY €
Hold u. 3, 1054 Budapest
Pastry, Sandwiches, Vegetarian-Friendly

17. BEST BAGEL BASILICA €€
Zrínyi u. 16, 1051, Budapest
Sandwich food

18. COOKIE BEACON BRUNCH €€
Hercegprímás u. 15, 1051, Budapest
Coffee, sweets, eggs, beacon

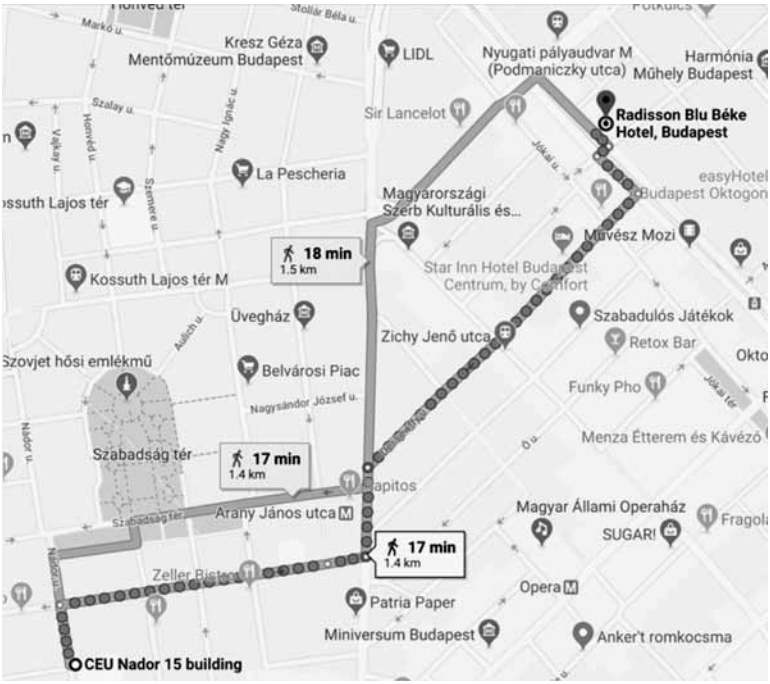
19 BOMBAY BUDAPEST €€
Október 6 u. 17, 1051, Budapest
Indian restaurant

20. HOPPÁ! BISTRO €-€€
Október 6 u. 15, 1051, Budapest
Hungarian restaurant with French twist

21. QUÍ RESTAURANT & BAR €€-€€€
Arany János u. 13, 1051, Budapest
Thai restaurant

22. POKITO €€
Nádor u. 17, 1051 Budapest
Hawaii superfood, poke bowls, fish

23. CAFE BRUNCH BUDAPEST BAZILIKA €€-€€€
Zrínyi u. 10, 1051, Budapest
Sandwiches, egg dishes, vegan, lactose, gluten free meals


Kresz Géza
Mentőmúzeum Budapest
LIDL
Nyugati pályaudvar M
(Podmaniczky utca)
Harmónia
Műhely Budapest
Radisson Blu Béke
Hotel, Budapest
Sir Lancelot
La Pescheria
Magyarországi
Szerb Kulturális és...
easyHotel
Budapest Oktogon
Művész Mozi
18 min
1.5 km
Kossuth Lajos tér M
Star Inn Hotel Budapest
Centrum, by Comfort
Üvegház
Szabadulós Játékok
Zichy Jenő utca
Retox Bar
Szovjet hősi emlékmű
Belvárosi Piac
Funky Pho
Nagysándor József u.
Menza Étterem és Kávézó
Szabadság tér
17 min
1.4 km
Arany János utca M
Magyar Állami Operaház
SUGAR!
17 min
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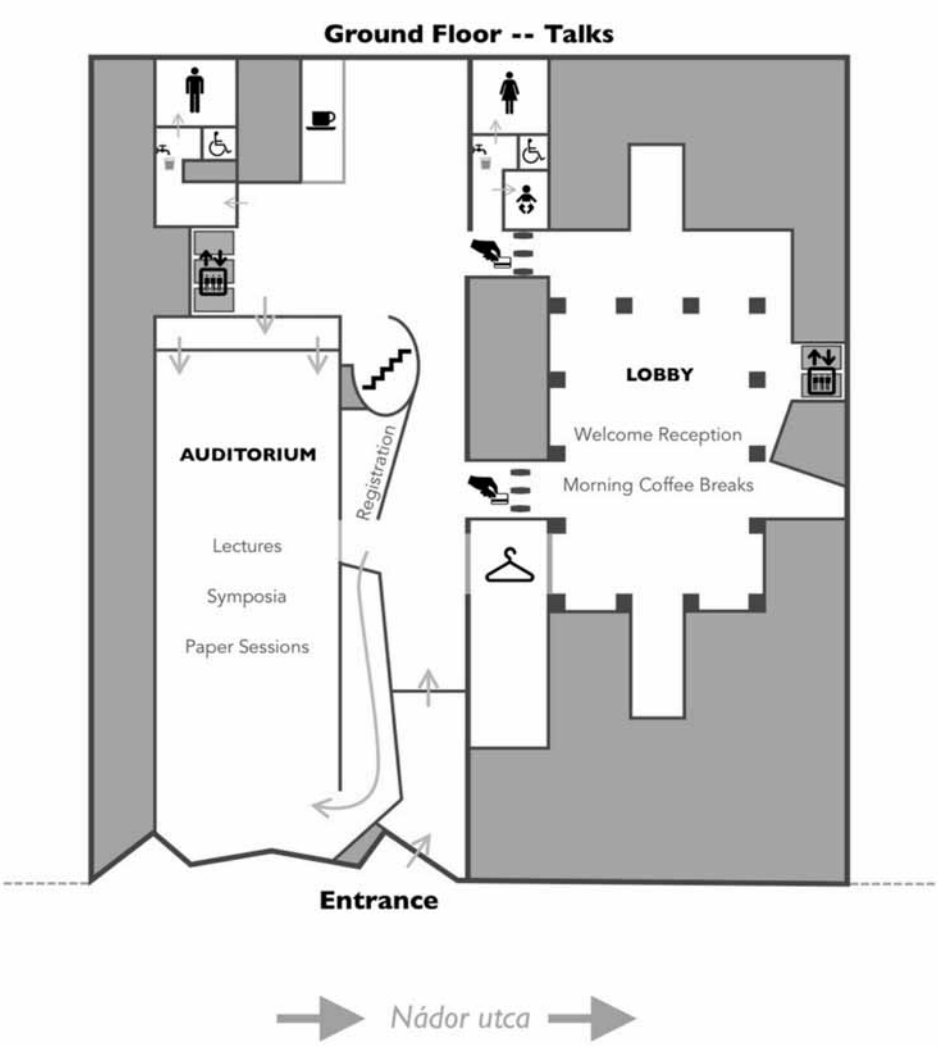
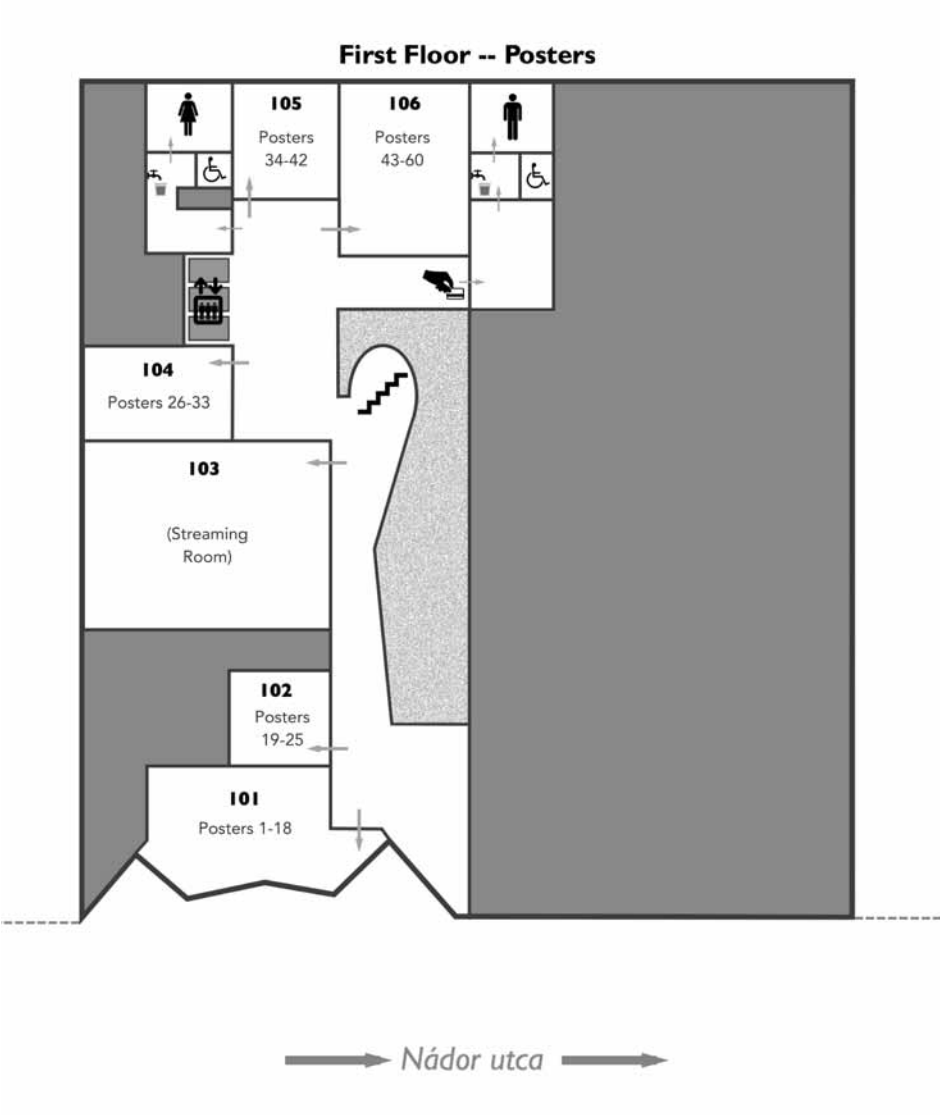
Opera M
Patria Paper
Miniversum Budapest
Anker't romkocsma
CEU Nador 15 building


Ground Floor -- Talks
AUDITORIUM
Lectures
Symposia
Paper Sessions
Registration
LOBBY
Welcome Reception
Morning Coffee Breaks
Entrance
Nádor utca


First Floor -- Posters
105
Posters
34-42
106
Posters
43-60
104
Posters 26-33
103
(Streaming
Room)
102
Posters
19-25
101
Posters 1-18
Nádor utca

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