

Cognitive
Development
Center



Department
of Cognitive
Science

Central European University

BCCCD



2012

Budapest CEU Conference on Cognitive Development

Program and Abstracts

Budapest CEU Conference on Cognitive Development

organized by
**Cognitive Development Center
Central European University**

<http://cognitivescience.ceu.hu>
<http://www.asszisztencia.hu/bcccd/>

12-14 January, 2012, Budapest

CONFERENCE ORGANIZATION

The conference is organized by the recently-established Cognitive Development Center at CEU, led by Professors Gergely Csibra and György Gergely.

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Ernő Téglás

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Mikołaj Hernik
Ágnes Melinda Kovács
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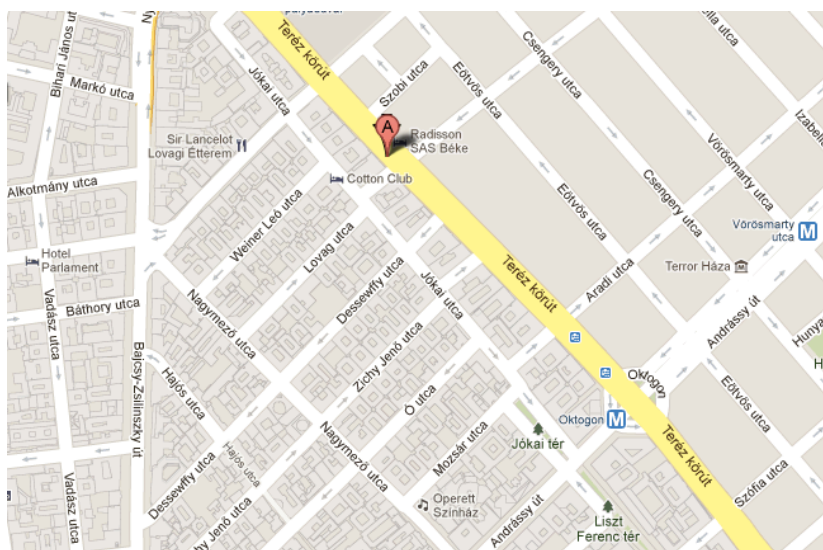
ORGANIZING SECRETARIAT

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CONFERENCE VENUE

Radisson Blu Béke Hotel****
1067 Budapest, Teréz krt. 43.
Phone: 0036 1 889-3900

GPS: 47° 30' 29" N, 19° 03' 33" E



January 12th

8.00-15.00 Registration

12.45-13.00 Welcome

13.00-15.00 Regular Symposium

Narrow-scope versus wide-scope approaches on action processing in infancy (Organizers: Ildikó Király & Birgit Elsner)

The Primacy of Means Selection over Outcome Selection Information in Infants' Goal Attribution Szilvia Bíró and Stephan Verschoor

Investigating the Neurocognition of Social Learning in Infancy: An Ideomotor Approach Markus Paulus, Sabine Hunnius and Harold Bekkering

Opacity and Relevance in Social Cultural Learning: Relevance-Guided Emulation in 14-Month-Olds Marian Chen, Ildikó Király and György Gergely

Language can Facilitate or Interfere with Action Perception in Infants Anja Gampe and Moritz Daum

15.00-15.30 Coffee break

15.30-17.30 Regular Symposium

Action understanding and goal prediction in infancy (Organizer: Gustaf Gredebäck)

Action prediction in infancy Victoria Southgate

Exploring the timeline of infants' action perception Moritz M. Daum

Action anticipation and the role of own experience Gustaf Gredebäck

Failed Action Understanding in Infancy: Developmental Milestones and Potential Mechanisms Amanda C. Brandone

Discussant Ben Kenward

17.30-18.00 Break

18.00-19.15 Keynote lecture: Lila Gleitman (University of Pennsylvania, USA)

Words can be learned by observation, but only when the shoe fits

19.30 Reception

January 13th

8.30-10.30 Regular Symposium

Theory of mind from infancy to adulthood: empirical and theoretical advances (Organizers: Ian Apperly & Ágnes Melinda Kovács)

Do Infants Have Beliefs About Beliefs? Or: how big
can a Performance Problem be Before it Becomes a Competence Problem?
Hannes Rakoczy

Decomposing Theory of Mind: Primary and Secondary Prerequisites
Ágnes Melinda Kovács

How do we Develop two Systems for Mindreading?
Ian Apperly and Stephen Butterfill

Discussant Gergely Csibra

10.30-11.00 Coffee break

11.00-13.00 Regular Symposium

Reference in infants' and toddlers' word learning

(Organizers: Elika Bergelson & Eugenio Parise)

ERP Evidence of Referential Word Understanding in
9-Month-Old Infants
Eugenio Parise and Gergely Csibra

6-11-month-olds' Comprehension of Concrete and
Abstract Words
Elika Bergelson and Daniel Swingley

Carefully Learning Words
Teodora Gliga and BASIS Team

Discussant Lila Gleitman

13.00-14.00 Lunch

14.00-15.15 Poster Session A

15.15-15.30 Break

15.30-17.00 Regular Symposium

Early Gricean pragmatics

(Organizer: Nausicaa Pouscoulous & Cat Davies)

The Development of Referential Informativeness
Cat Davies, Tiffany Morisseau, Danielle Matthews, Napoleon Katsos, C. Roqueta and C. Norbury

Children's Comprehension of Sentences with the
Presupposition- Triggering Particle *auch*
Frauke Berger and Barbara Höhle

Early Birds: Development of Metaphor
Comprehension
Nausicaa Pouscoulous and Michael Tomasello

17.00-17.30 Coffee break

17.30-19.00 Invited Symposium

Symposium title: Probabilistic models, inductive inference and possible worlds
(Organizer: Laura Schulz)

Noisy Newtons: People's intuitive understanding of physics explains their cause and prevention judgments Tobias Gerstenberg

Logic and Probability at 12 months Luca Bonatti

Where Science Starts: Rational inference in infancy and early childhood Laura Schulz

January 14th

9.00-10.15 Invited Speakers: Ilona Kovács (BME) and István Winkler (MTA)

Ready to experience: binocular function is turned on earlier in preterm infants (Kovács)

Sensitivity to auditory temporal stimulus parameters in newborn infants (Winkler)

10.15-10.45 Coffee break

10.45-12.45 Regular Symposium

Becoming an artefact expert: independent problem solving and conventional wisdom

(Organizers: Sarah R. Beck and Nicola Cutting)

When do Children Learn the Knowledge Needed to use Artefact? Development of the Artefact Lexicon Andrew Simpson, Kevin J. Riggs and Katarzyna Kostyrka

Young Children's Reasoning of Artifact Function Across Different Contexts: an Action-Protest Paradigm Margaret A. Defeyter, Joanne Underwood, and Tamsin C. German

Copy you or Copy me: The Effect of Prior Personally-Acquired Information on Artefact use Lara A. N. Wood, Rachel Kendal and Emma Flynn

Making Tools: Problem Solving and Transferring Knowledge Sarah R. Beck, Nicola Cutting, Ian Apperly and Jackie Chappell

12.45-14.00 Lunch

14.00-15.15 Poster Session B

15.15-15.45 Coffee break

15.45-17.45 Regular Symposium

The elements of fairness

(Organizers: Keith Jensen and Peter R. Blake)

Altruism, Fairness and Social Learning: A Cross-Cultural Approach to Imitative Altruism Peter R. Blake, Tara C. Callaghan, John Corbit and Felix Warneken

The Role of Other's Intentions in Resource Distribution Martina Wittig, Keith Jensen and Michael Tomasello

Inequity Aversion in Children: The Importance of Outcomes and Audience Effects Katherine McAuliffe, Peter R. Blake and Felix Warneken

Punishment and Spitefulness: Cooperation's Dark Heart Keith Jensen

19.00 Dinner

Budapest CEU Conference on Cognitive Development

Keynote Lectures

KL1-----1

WORDS CAN BE LEARNED BY OBSERVATION, BUT ONLY WHEN THE SHOE FITS

Lila Gleitman, John Trueswell and Tamara Nichol Medina

KL2-----2

READY TO EXPERIENCE: BINOCULAR FUNCTION IS TURNED ON EARLIER IN PRETERM INFANTS

Ilona Kovács

KL3-----2

SENSITIVITY TO AUDITORY TEMPORAL STIMULUS PARAMETERS IN NEWBORN INFANTS

István Winkler

Invited Symposia

IS-001-----3

ACTION UNDERSTANDING AND GOAL PREDICTION IN INFANCY

Action prediction in infancy

Victoria Southgate

Exploring the timeline of infants' action perception

Moritz M. Daum

Action anticipation and the role of own experience

Gustaf Gredebäck

Failed Action Understanding in Infancy: Developmental Milestones and Potential Mechanisms

Amanda C. Brandone

IS-002-----7

SYMPOSIUM TITLE: PROBABILISTIC MODELS, INDUCTIVE INFERENCE AND POSSIBLE WORLDS

Noisy Newtons: People's intuitive understanding of physics explains their cause and prevention judgments

Tobias Gerstenberg

Logic and Probability at 12 months

Luca Bonatti

Where Science Starts: Rational inference in infancy and early childhood

Laura Schulz

Regular Symposia

RS-001 -----9

NARROW-SCOPE VERSUS WIDE-SCOPE APPROACHES ON ACTION PROCESSING IN INFANCY

The Primacy of Means Selection over Outcome Selection Information in Infants' Goal Attribution

Szilvia Bíró and Stephan Verschoor

Investigating the Neurocognition of Social Learning in Infancy: An Ideomotor Approach

Markus Paulus, Sabine Hunnius and Harold Bekkering

Opacity and Relevance in Social Cultural Learning: Relevance-Guided Emulation in 14-Month-Olds

Marian Chen, Ildikó Király and György Gergely

Language can Facilitate or Interfere with Action Perception in Infants

Anja Gampe and Moritz Daum

RS-002 -----14

THEORY OF MIND FROM INFANCY TO ADULTHOOD: EMPIRICAL AND THEORETICAL ADVANCES

Do Infants Have Beliefs About Beliefs? Or: how big can a Performance Problem be Before it Becomes a Competence Problem?

Hannes Rakoczy

Decomposing Theory of Mind: Primary and Secondary Prerequisites

Ágnes Melinda Kovács

How do we Develop two Systems for Mindreading?

Ian Apperly and Stephen Butterfill

RS-003 -----18

REFERENCE IN INFANTS' AND TODDLERS' WORD LEARNING

ERP Evidence of Referential Word Understanding in 9-Month-Old Infants

Eugenio Parise and Gergely Csibra

6-11-month-olds' Comprehension of Concrete and Abstract Words

Elika Bergelson and Daniel Swingley

Carefully Learning Words

Teodora Gliga

BASIS Team (Mayada Elsabbagh, Rachael Bedford, Kristelle Hudry, Tony Charman, Mark Johnson)

RS-004 -----22

EARLY GRICEAN PRAGMATICS

The Development of Referential Informativeness

Cat Davies, Tiffany Morisseau, Danielle Matthews, Napoleon Katsos, C. Roqueta and C. Norbury

Children's Comprehension of Sentences with the Presupposition-Triggering Particle auch

Frauke Berger and Barbara Höhle

Early Birds: Development of Metaphor Comprehension

Nausicaa Pouscoulous and Michael Tomasello

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BECOMING AN ARTEFACT EXPERT: INDEPENDENT PROBLEM SOLVING AND CONVENTIONAL WISDOM

When do Children Learn the Knowledge Needed to use Artefact?

Development of the Artefact Lexicon.

Andrew Simpson, Kevin J. Riggs and Katarzyna Kostyrka

Young Children's Reasoning of Artifact Function Across Different Contexts: an Action-Protest Paradigm

Margaret A. Defeyter, Joanne Underwood, and Tamsin C. German

Copy you or Copy me: The Effect of Prior Personally-Acquired Information on Artefact use

Lara A. N. Wood, Rachel Kendal and Emma Flynn

Making Tools: Problem Solving and Transferring Knowledge

Sarah R. Beck, Nicola Cutting, Ian A. Apperly and Jackie Chappell

RS-006 -----30

THE ELEMENTS OF FAIRNESS

Altruism, Fairness and Social Learning: A Cross-Cultural Approach to Imitative Altruism

Peter R. Blake, Tara C. Callaghan, John Corbit and Felix Warneken

The Role of Other's Intentions in Resource Distribution

Martina Wittig, Keith Jensen and Michael Tomasello

Inequity Aversion in Children: The Importance of Outcomes and Audience Effects

Katherine McAuliffe, Peter R. Blake and Felix Warneken

Punishment and Spitefulness: Cooperation's Dark Heart

Keith Jensen

POSTER SESSION A

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TRACX: A new connectionist model of statistical learning. (Now with added web simulator)

C. Addyman, R.M. French and D. Mareschal

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Does iconicity influence referential understanding of pictures in low-functioning children with autism?

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Human infants represent social dominance as a relation

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Neural underpinnings of feedback monitoring in toddlers

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I. Nomikou, K. Lohan and K.J. Rohlfing

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Powerful influence from humans in infancy

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The development of naming in children: empirical data and a new computational model of lexical access

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The Roots of Normativity: 18-Month-Old Infants Intervene in Game Rule Violations

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Young Children Enforce Third-Party Entitlement Rights Selectively

M.F.H. Schmidt, H. Rakoczy and M. Tomasello

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Is it resulting or intentional action that young children tend to imitate?

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Action Prediction may Benefit From Own Action Experience

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Age-related and Age-independent Individual Differences in Strategic Social Behaviour Are Mediated by Impulse Control and Underlying Functions of the left DLPFC

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Planning Ahead - Do Young Children Represent Their Partner's Tool-Choice in a Collaborative Task?

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Self-regulation skills among school-age children: The relationship with cognitive and academic achievements as well as with outcomes of a cognitive training

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Infants learn from multiple sources of visual information

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E. Szabó and A. Krajcsi

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Educating each other's attention: Mothers' and infants' eye-contact within natural interactions at 3 and 6 months of age

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Effects of experimental communication factors on working memory performance

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What helps children to acquire new object names on the basis of unobservable information?		
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Motion cues evoke anticipatory shifts of covert attention during action observation		
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Prelinguistic infants use vocalizations to communicate intentionally		
<i>T. Grünloh and U. Liszkowski</i>		

Keynote Lectures

KL1

WORDS CAN BE LEARNED BY OBSERVATION, BUT ONLY WHEN THE SHOE FITS

Lila Gleitman, John Trueswell and Tamara Nichol Medina

University of Pennsylvania, USA

Word learning poses a classic poverty of the stimulus problem because new words are uttered in a complex situational environment, and thus are subject to alternative interpretations. While Hume's (1739) solution to this problem -- radically restricting the infant's primitive representational base -- has not stood the test of time, aspects of his associative-constructivist model for observational learning have continued to dominate psychological theorizing on this topic. Indeed, several recent studies have reported that adults can successfully pair nonce sounds ("words") and pictures ("referents") over a small set of referentially ambiguous trials (e.g., Yu & Smith 2007). This success has been argued to be the result of participants tracking multiple possible word-referent pairings, using a statistical learning mechanism to gradually converge on a single hypothesized mapping. We argue instead that this success is the product of a different learning procedure in which only a single hypothesized word-referent pairing (but no alternative pairings) is retained across learning instances, abandoned only if the subsequent instance fails to confirm the pairing -- more like a 'fast mapping' procedure (Carey, 1978) than a statistical one (Medina, Snedeker, Gleitman, & Trueswell, 2011). We provide experimental evidence for this 'propose-but-verify' learning procedure, in several experiments in which participants attempted to learn the meanings of novel words cross-situationally under varying presentation conditions. Some of these studies varied the quality of the evidence and the presentation conditions; others varied the degree of referential uncertainty. The findings show that (1) if the input is naturalistic, rather than frozen image-nonce word pairs, cross-situational learning breaks down almost entirely; (2) even using a small number of simplified stimuli, participants do not retain multiple meaning hypotheses across learning instances, as measured with an explicit measure of memory (referent selection) or an implicit measure (eye movements). In general discussion, I try to set the findings in a broader context (Gleitman et al., 2005): For most words beyond basic-level whole-object nouns (Heilbeck & Markman, 1987), raw observation provides very little constraint on interpretation. Successful vocabulary acquisition even in novices recruits a rich variety of social, cognitive, and linguistic cues in a statistical constraint-satisfaction learning procedure.

KL2

READY TO EXPERIENCE: BINOCULAR FUNCTION IS TURNED ON EARLIER IN PRETERM INFANTS

Ilona Kovács

Budapest University of Technology and Economics

The cerebral cortex of the human brain is remarkably prone to environmental input early in life; however, the precise contribution of experience in the development of cortical functions is unresolved. Employing a visual evoked potential paradigm, we ask whether the extra postnatal visual experience in preterm human neonates leads to a change in the developmental timing of binocular vision. The results suggest that the developmental processes preceding the onset of binocular function are not preprogrammed, and that the mechanisms turning on stereopsis are experience-dependent. This finding opens up a number of further queries with respect to human-specific cortical plasticity.

KL3

SENSITIVITY TO AUDITORY TEMPORAL STIMULUS PARAMETERS IN NEWBORN INFANTS

István Winkler

Hungarian Academy of Sciences

Most previous research on sound discrimination in neonates focused on spectral stimulus parameters, such as pitch, intensity, and timbre. Here we review the results of experiments testing by event-related brain potentials the sensitivity of the newborn auditory system to temporal stimulus parameters. We start with the most primitive temporal stimulus parameter, sound duration. We then discuss the results of studies testing whether newborns can detect changes in the onset-to-onset interval in sound trains (the tempo of a sound sequence). Finally, we describe results related to the higher-order temporal structure of sound sequences, such as the detection of cyclic repetition and rhythm.

Invited Symposia

IS-001

ACTION UNDERSTANDING AND GOAL PREDICTION IN INFANCY

Organizer

Gustaf Gredebäck (Uppsala University, Sweden)

Participants

Victoria Southgate (Birkbeck, University of London, UK)

Moritz Daum (Max Planck Institute for Human Cognitive and Brain Sciences, Germany)

Gustaf Gredebäck (Uppsala University, Sweden)

Amanda Brandone (Lehigh University, Bethlehem, PA, USA)

Discussant

Ben Kenward (Uppsala University, Sweden)

When observing another person performing a manual action, humans typically fixate the goal of the action before the hand reaches the goal. This predictive ability emerges early in infancy and remains an important foundation for social cognitive development throughout life. It allows us to synchronize our actions with collaborators and to stay ahead of competitors, while compensating for the internal processing lag of the perception-action system.

The current symposium presents four talks that focus on different aspects of infants' ability to predict action goals. The first speaker, Victoria Southgate, presents data demonstrating that infants generate goal predictions for actions that are both within, and outside of, their own motor repertoire. The second speaker, Moritz Daum, focuses on the time-line of action understanding, differentiating priming, prediction, and evaluation as three sub-components of action understanding. The third speaker, Gustaf Gredebäck, talks about how experience and kinematic information influence action prediction. Last, but not least, Amanda Brandone, present studies investigating how infants understand failed actions while discussing the importance of self-locomotion and joint-attentive social interactions. Ben Kenward ends the symposium with a discussion, arguing that infants might not plan actions around future goals in their everyday interaction with the world.

Action prediction in infancy

Victoria Southgate

Birkbeck, University of London, UK

Although we know much about infants abilities to structure observed actions in terms of targets or goals, we know relatively little about their abilities to generate predictions about action goals and action pathways. Recently, two claims have been made concerning infants' abilities to generate predictions about action goals. Firstly, it has been proposed that there may be a dissociation between infants abilities to retrospectively identify a target as the goal of an action, and infants abilities to predict that a target will be the goal of the action (Daum, 2011). Secondly, it is hypothesized that infants' abilities to predict an action is determined by their ability to perform the observed action (e.g. Kanakogi & Itakura, 2011). I will present data that challenges both of these claims. I will show that infants generate action predictions at around the same time that they can be shown to interpret those actions as goal-directed via retrospective measures. I will further show that they can generate goal predictions for actions that are both within, and outside of, their own motor repertoire.

Exploring the timeline of infants' action perception

Moritz M. Daum

Max Planck Institute for Human Cognitive and Brain Sciences, Germany

Episodes of action perception comprise of a number of component processes operating at different processing stages: The identification of the agent prior to or during the ongoing action; the online processing during the action; and the post hoc processing after an action is completed. Here, I will focus on these component processes of infants' action perception. A set of studies will be presented that intend to quantify singular processing stages as well as their relation to each other and to the developing action production skills. Two aspects concerning the development of action perception will be discussed. First, the results reveal surprising dissociations in the development of action perception. In particular, conflicting results within and between age groups are reported when virtually the same knowledge is assessed with different paradigms. Second, inconsistent results concerning the developing relationship between action perception and production are discussed concerning the relation of action production to the different component processes of action perception.

Action anticipation and the role of own experience

Gustaf Gredebäck

Uppsala University, Sweden

The ability to anticipate the goals of observed actions is paramount for a successful interaction with others. Despite of this, little is known about the mechanisms that drive the development of action anticipation abilities. I will address two central aspects of action anticipation. First, I will review prior studies demonstrating that infants own experience influence their ability to anticipate action goals of other people's actions. Secondly, I will present data suggesting that adult observers are able to anticipate the goal of reaching actions expressed as biological motion point light displays. Infants are unable to anticipate the same events, but they are faster to fixate the goal of a point-light manual action than a scrambled non-biological point-light display. Together these findings suggest that infants and adults are able to map observed actions onto their own motor system and use this mapping to orient to action goals.

Failed Action Understanding in Infancy: Developmental Milestones and Potential Mechanisms

Amanda C. Brandone

Lehigh University, Bethlehem, PA, USA

When and how do infants develop an understanding of intention—that is, an understanding of human behavior as guided by subjective internal states? To address these questions, in this talk I discuss two studies examining infants' (8 to 12 months) understanding of failed actions. Failed action understanding is used as a marker of intention understanding because it requires recognizing that an observed action is distinct from the intention motivating it.

Study 1 used habituation to assess when infants understand that a failed action is intentional and whether an understanding of successful actions precedes an understanding of failed actions. Study 2 used eye tracking to examine whether infants can predict the goals of ongoing successful- and failed-reaching actions. Performance on the eye-tracking task was also examined in relation to parent-report measures of behaviors proposed to be linked to the development of intention understanding, namely joint attention and self-locomotion.

Three central findings emerged. First, by 10 months infants understand and can predict the goal of a failed action. Second, understanding successful actions precedes understanding failed actions. Third, failed action understanding is strongly associated with infants' tendency to initiate joint attention and their ability to locomote independently.

INVITED SYMPOSIA

Overall, results support a developmental picture wherein an understanding of intention emerges during the first year from an antecedent understanding of the surface relations between agents and objects. Preliminary evidence also highlights the potential importance of self-locomotion and joint-attentive social interactions in constructing representations of others as intentional. Developmental mechanisms and implications are discussed.

IS-002

SYMPOSIUM TITLE: PROBABILISTIC MODELS, INDUCTIVE INFERENCE AND POSSIBLE WORLDS

Organizer

Laura Schulz (MIT)

Participants

Tobias Gerstenberg (University College London, UK)

Luca Bonati (Universitat Pompeu Fabra, Barcelona, Spain)

Laura Schulz (Massachusetts Institute of Technology, Boston, USA)

Ordinary reasoning about the actual world depends on our beliefs about possible worlds. In order to attribute credit or blame, learners must compare what did happen to what might have happened; in order to predict single event outcomes, learners must represent future states of the world, and in order to explore effectively, learners must represent and estimate the probability of learning new information. The three studies in this symposium combine computational models and empirical methods to look at how consideration of possible worlds affects causal judgments, predictions, and exploration from infancy to adulthood.

Noisy Newtons: People's intuitive understanding of physics explains their cause and prevention judgments

Tobias Gerstenberg

University College London, UK

There is a long tradition in both philosophy and psychology to separate difference-making accounts from process accounts of causation. In this talk, I will motivate a unifying account that explains people's causal judgments in a physical domain in terms of counterfactuals defined over probabilistic generative models. In our experiments, participants see two billiard balls colliding and indicate to what extent ball A caused/prevented ball B to go through a hole. Our model predicts that people arrive at their causal judgments by

comparing what actually happened with what they think would have happened, had the collision between A and B not taken place. Participants' judgments about what would have happened are highly correlated with a noisy model of Newtonian physics ($r > .9$). Using those counterfactual judgments, we can predict participants' cause ($r = .99$) and responsibility ($r = .97$) ratings in two different experiments. Our framework also allows us to capture intrinsically counterfactual causal judgments such as almost caused/prevented.

Logic and Probability at 12 months

Luca Bonatti

Universitat Pompeu Fabra, Barcelona, Spain

In the last 30 years, the cognitive sciences have been marked by one great idea proposed by Fodor: The modularity of mind. Fodor had another great idea: that of a language of thought. To a certain extent, the two ideas are partially in conflict. While the former has produced an incredible amount of science, the latter has not generated real empirical research. I will try to show what it means to transform that idea into a research program. I will revise evidence on infants' abilities at reasoning about probabilistic logical events. I will comment about what these results mean for an empirical LOT hypothesis and for the general picture of the human mind.

Where Science Starts: Rational inference in infancy and early childhood

Laura Schulz

Massachusetts Institute of Technology, Boston, USA

Science is a late-emerging, culturally specific development practiced by a tiny minority of the human species. However, science may be effective in part because many of its inferential processes emerged to solve the hard problem of learning in early childhood: the need to draw rich, rapid, accurate inferences from sparse data. Here I suggest that although children's behavior, particularly in play, may seem noisy and unstructured, it contains within it highly systematic exploratory behaviors and inferential processes that mirror, to a striking degree, the formal, explicit processes that our culture has canalized for scientific discovery. Consistent with this, I will present four studies suggesting that very young children rationally constrain their generalizations from samples to populations, use sparse statistical data for causal attributions, isolate variables in response to confounded evidence, and rationally trade-off learning from instruction and exploration. These studies suggest that children entertain hypotheses about possible worlds and use these hypotheses to govern their exploration of the actual world.

Regular Symposia

RS-001

NARROW-SCOPE VERSUS WIDE-SCOPE APPROACHES ON ACTION PROCESSING IN INFANCY

Organizer

Ildikó Király (Eötvös Loránd University, Budapest) & Birgit Elsner (University of Potsdam, Germany)

Participants

Szilvia Bíró (University of Leiden, The Netherlands)

Markus Paulus (Ludwig Maximilian University, Germany)

Marian Chen (Central European University, Budapest)

Anja Gampe (Max Planck Institute for Human Cognitive and Brain Sciences, Leipzig, Germany)

The impact of cognitive or inferential processes in infants' action perception and production has become a subject of great interest and continuous dispute in developmental psychology. Whereas some researchers claim to prove the availability of general interpretative schema sub-serving action perception already in infants (e.g. teleological stance, Bíró & Leslie, 2007; Csibra, 2008), representing a wide-scope perspective on action processing; others argued for the emergent role of one's own motor development in the perception of others' actions, representing a narrow-scope perspective in action perception (e.g. Sommerville et al., 2005).

The planned contributions explore the scope and significance of cognitive processes in infants' understanding of goal-directed action.

Paper 1 reports two studies that demonstrate the primacy of means selection information (i.e. whether an action is causally efficient toward the outcome) over outcome selection information (i.e. whether an action expresses a choice between potential outcomes) in infants' goal attribution.

Paper 2 presents studies on infants' action perception using an imitation paradigm and EEG: the results suggest that, by means of observation, infants acquire bidirectional action-effect-associations, which subserve infants' imitative learning from others' actions and their effects.

Paper 3 will present evidence that social and cultural factors influence how infants generalize the goal of an action based on efficiency evaluation.

Paper 4 investigated the influence of language perception on action perception with a two-fold task. Results of the studies suggest that language influences action prediction, but not action imitation

In conclusion, the experimental and theoretical efforts in this symposium tend to highlight the factors that are either able to prove or able to rule out the potential role of inferential processes in action perception in infants. It aims to facilitate integrative discussions and explores possible solutions for an intensely discussed topic in developmental research.

The Primacy of Means Selection over Outcome Selection Information in Infants' Goal Attribution

Szilvia Bíró and Stephan Verschoor

University of Leiden, The Netherlands

To interpret an observed action as goal-directed one can make use of two types of information in a given situation. One type of information consists of the observation that, to achieve the goal, the actor adjusts the action to the situational constraints ("means selection"). The other type of information is the availability of alternative outcomes and the expression of a preference for a particular outcome by the actor's action ("outcome selection").

It has been shown that, when observing an action, infants can rely on either outcome selection (Woodward, 1998) or means selection information (Gergely et al., 1995) in their goal attribution. However, no research has investigated the relationship between these two types of information.

In the first study we investigated whether infants can transfer their goal attribution between situations that contain different types of information. We found that infants, who had attributed a goal when means selection information was available, generated expectations about the actor's action in another scenario in which outcome selection information was present.

In second study we tested infants' goal attribution when both types of information were available. We found that when outcome selection information could disambiguate the goal of the action but means selection information could not infants did not attribute a goal to an observed action.

These findings together suggest that means selection information takes primacy over outcome selection information. The early presence of this bias sheds light on the nature of the notion of goal in action understanding.

Investigating the Neurocognition of Social Learning in Infancy: An Ideomotor Approach

Markus Paulus^{1,2}, Sabine Hunnius² and Harold Bekkering²

¹ Ludwig Maximilian University, Munich, Germany

² Donders Institute, Radboud University Nijmegen, The Netherlands

The neurocognitive mechanisms underlying infants' ability for social learning have been hotly disputed. Paulus and colleagues (2011) have suggested that one important mechanism subserving imitative learning is the acquisition of bidirectional-action-effect-associations (i.e. associations between motor codes and effect codes) through motor resonance rather than an evaluation of the efficiency of the observed action.

In this contribution we report recent findings that provide support for this theoretical approach. In a study modeled on Gergely et al. (2002), we investigated whether 14-month-olds would imitate the headtouch irrespective of the efficiency of the observed action (hands free vs. hands occupied), when the lamp was put up on a rack and infants in both conditions could "mirror" thus the observed head-action. Infants in both groups imitated the headtouch to a greater extent (60-70%) than in a control condition in which the model only used her hands (20%). A second study examined whether action-effect associations can be acquired by observational learning by means of a reaction-time task. Participants observed how a model repeatedly pressed two buttons during an observation phase. Each of the button presses led to a specific tone (action effect). In a subsequent test phase the tones served as target stimuli to which the participants had to respond with button presses. Reaction times were shorter if the stimulus-response mapping in the test phase was compatible with the action-effect association in the observation phase. This suggests that participants had acquired action-effect associations by observational learning.

Implications of these findings for current theories of social learning in infancy will be discussed.

Opacity and Relevance in Social Cultural Learning: Relevance-Guided Emulation in 14-Month-Olds

Marian Chen¹, Ildikó Király² and György Gergely¹

¹ Cognitive Development Center, Central European University, Budapest, Hungary

² Eötvös Loránd University, Cognitive Psychology Department, Budapest, Hungary

Is the selective imitation of a non-efficient head action in ostensive contexts the result of blind imitation subserved by automatic motor processes, or guided by a communicative-inferential learning process? If the latter, then infants should generalize a learned behavior/goal to situations beyond the demonstrated context. We present evidence for generalization of imitation by 14-month-olds in two novel contexts.

In Experiment 1, infants readily extended imitation of an unusual action (touching a light with the head) to a novel exemplar of the demonstration object, showing that they understood that the action was not specific to the demonstration lamp, but could be generalized to other objects of the same type. The results of our experiment also provide the first evidence that infants generalize a response to a novel functional artifact to another exemplar of the same kind after a single ostensively-presented demonstration.

In Experiment 2, building on the finding that infants continue to imitate even when the model is no longer present at test, we investigated whether infants would continue to imitate in the presence of novel experimenters, and if so, whether generalization of imitation was guided by cultural boundaries. We found that infants readily generalized imitation even when an outgroup experimenter (marked by race and language) was present at test.

Finally, we discuss evidence of emulative behavior in both experiments which argues strongly against motor resonance explanations of imitation. These emulative behaviors suggest that infants encode not the experimenter's motor program, but rather an abstract representation of the experimenter's goal.

Language can Facilitate or Interfere with Action Perception in Infants

Anja Gampe and Moritz Daum

Research Group Infant Cognition and Action, Max Planck Institute for Human Cognitive and Brain Sciences, Leipzig, Germany

Cognitive processes like language comprehension interacts with action perception in adults which resulted in a simulationist view of language comprehension (Zwaan, & Taylor, 2006)

stating that language is not an abstract independent entity but an integrative part of the perceptual and motor representation of actions. But so far little is known about the interrelation of language and action perception in infants.

In two studies, we investigated the influence of language perception on action perception in a two-fold task. Infants from 12 to 30 months were presented with an action prediction task in which the children watched videos of actions that were either labeled (label condition) or not labeled (baseline condition). We measured predictive gaze via anticipation times using an eye tracker. Subsequently, infants had the opportunity to imitate the observed actions and imitation quality was evaluated. In Study 1 familiar and novel actions were presented, in Study 2 we used verbs that were either early or late acquired.

Results of both studies suggest that language influences action prediction, but not action imitation. While action prediction and action imitation are bound from early on, language is earliest integrated into action perception at 18 months and stable from 24 months on. Early familiar and novel labels facilitate action perception in comparison to the baseline condition but late familiar and incongruent (action and label do not match) interfere with action perception.. The results are discussed in relation to an integrative framework of action perception including sensorimotor (embodied) as well as linguistic (symbolic) aspects.

RS-002**THEORY OF MIND FROM INFANCY TO ADULthood: EMPIRICAL AND THEORETICAL ADVANCES****Organizer**

Ian Apperly (University of Birmingham, UK) & Ágnes Melinda Kovács (Central European University, Budapest)

Participants

Hannes Rakoczy (University of Goettingen)
Ágnes Melinda Kovács (Central European University)
Ian Apperly (University of Birmingham)

Discussant

Gergely Csibra (Central European University)

More than 30 years of research on theory of mind in humans has focussed almost exclusively on the abilities of children aged 2 to 6 years of age. In recent years this situation has changed dramatically in two directions, with substantial programmes of research investigating theory of mind abilities in human infants and human adults. Findings from infants, in particular, have already attracted widespread discussion and commentary, though the terms of debate have been narrowly focussed on when and whether infants should be credited with key concepts about beliefs, knowledge and intentions. However, there has been little discussion of the broader developmental picture that relates the abilities of infants – whatever they are – to the abilities of children and adults. The current symposium brings together speakers actively engaged in research that takes this broader developmental view, and a discussant who is a key contributor to contemporary theory in developmental psychology.

Hannes Rakoczy evaluates the debate surrounding infants' and children's theory of mind abilities by deploying a theoretical distinction between doxastic states (i.e., personal level beliefs) and sub-doxastic states (i.e., informational states of a system at a sub-personal level). He then considers the implications of this distinction for understanding the role of "executive processes" in theory of mind abilities across development. In particular he considers the difference between executive performance and executive competence accounts of theory of mind abilities. Performance accounts lend themselves to a view of developmental continuity between infants and adults. Competence accounts, by contrast, suggest that there must be qualitative changes in theory of mind abilities over development, and that executive function serves qualitatively different roles in the theory of mind abilities of infants and adults.

Agnes Kovacs distinguishes between “primary” and “secondary” theory of mind abilities. Primary abilities include forming representations of agents with beliefs, they are undemanding of executive resources and are present in infants as well as in children and adults. Secondary abilities include making explicit predictions based on primary abilities, they are demanding of executive resources and may only be present in children and adults. Importantly, by breaking the monolithic notion of “theory of mind” into sub-components, this view provides a way of understanding how theory of mind can appear simultaneously automatic and efficient and non-automatic and effortful.

Ian Apperly and Stephen Butterfill start from the premise that adults have “two systems” for theory of mind; one that is flexible but cognitively demanding, and another that is cognitively efficient but inflexible. If this is the ultimate outcome of development, then developmental psychology must explain how two systems develop. A key question is whether the abilities of infants remain fundamentally intact over developmental time, or whether they become elaborated into the sophisticated theory of mind abilities of adults.

Do Infants Have Beliefs About Beliefs? Or: how big can a Performance Problem be Before it Becomes a Competence Problem?

Hannes Rakoczy

University of Goettingen, Germany

Do infants have a theory of mind (ToM)? What I’ll argue in this talk is that the question is somewhat ambiguous and that in the debate about it there is considerable talking past each other: researchers pro and con infant theory of mind respond actually to different readings of the question, giving answers seemingly in conflict with each other but actually quite compatible - answers to different questions. To avoid such misunderstanding, more conceptual clarity is needed. Some central conceptual distinctions from recent philosophy of mind will therefore be made use of – distinctions between different types of representations. In particular, fully-fledged beliefs ascribed at the personal level (Dennett, 1969) are contrasted with so-called sub-doxastic informational states (Stich, 1978) at the subpersonal level. This distinction will then be applied to ToM –both regarding infancy, and from a more general lifespan perspective- at two levels: first regarding the type of attitude subjects take towards others (do they believe something about others’ mental states, or do they engage in simpler kinds of states?), and second, regarding the kind of attitude they ascribe to others (beliefs, or some simpler kinds of state?).

Applying these conceptual distinction will help to clarify a number of issues pertaining to the questions of convincing non-verbal indicators of ToM proper and pertaining to the role of executive function in ToM reasoning: is it a mere add-on to the core conceptual capacity, crucial in overcoming mere performance problems in explicit tasks, or is it a constitutive

part of truly conceptual capacities which by their nature are usable in flexible ways in the rational control of action?

Decomposing Theory of Mind: Primary and Secondary Prerequisites

Ágnes Melinda Kovács

Cognitive Development Center, Central European University, Budapest, Hungary

Everyday social interactions require efficient mechanisms to infer others' goals and beliefs. Research in the last 25 years suggested that such "Theory of Mind" (ToM) abilities arise only after the age of four and require effortful computations, though recent evidence suggests that young infants succeed on simplified ToM tasks. Furthermore, while studies targeting adults suggest that ToM relies on effortful processes; other investigations propose that ToM involves automatic mechanisms. Thus, despite extensive research, both the development and the underlying mechanisms of belief computation are poorly understood. In this talk I propose that ToM abilities cannot be considered as a monolithic construct, but they should be divided into separable underlying component mechanisms. Specifically, I will consider five potential component mechanisms, involved in i) identifying others' beliefs (opening a 'belief file'); ii) computing the content of such beliefs; iii) linking belief representations to the corresponding agents; iv) sustaining two or more belief representations concurrently; and v) making explicit predictions based on others' beliefs. Experimental data suggests that while some of these components (primary ToM prerequisites: i-iii) might involve automatic processes and might be present in early infancy, other components (secondary prerequisites: iv-v) might require effortful cognitive processing. Investigating the possible subcomponents separately and a careful analysis of the components involved in various ToM tasks may allow us to reconcile the apparently contradictory findings in this domain. Such efforts target a better understanding of how ToM operates, and may generate new perspectives for understanding the mechanisms underlying complex social interactions crucial to human societies.

How do we Develop two Systems for Mindreading?

Ian Apperly¹ and Stephen Butterfill²

¹ University of Birmingham, UK

² University of Warwick, UK

Experimental evidence, and reflection on everyday examples suggest that adults' mindreading is both flexible and sophisticated (as when judging someone's guilt in a court of law) and fast and efficient (as when taking part in a competitive sport). However, conceptual analysis, and evidence from analogous cognitive domains, suggests that a single cognitive process for "theory of mind" is unlikely to be able to meet these diverse demands. This leads to the proposition that adults have "two systems" for mindreading that

make different processing trade-offs between flexibility and efficiency (Apperly & Butterfill, 2009).

How are adults' two systems related to the mindreading abilities observed in infants? One possibility is that the infant system grows up: although simple and cognitively efficient at the outset the infant system becomes increasingly sophisticated as children gain conceptual, linguistic and executive resources. On this view, the cognitively efficient abilities of adults must have some other origin, perhaps in automatization of abilities that were previously effortful. A second possibility is that the infant system persists: the system that explains efficient mindreading in infants also explains efficient mindreading in adults. On this view the flexible and sophisticated abilities of adults must have some other origin, perhaps in the protracted developments charted in traditional studies of children's "theory of mind". We will draw inspiration from Susan Carey's work on "signature limits" in other aspects of core cognition to identify evidence that might distinguish between these accounts.

RS-003

REFERENCE IN INFANTS' AND TODDLERS' WORD LEARNING**Organizer**

Elika Bergelson (University of Pennsylvania, USA) & Eugenio Parise (Central European University, Budapest)

Participants

Eugenio Parise (Central European University, Budapest)
Elika Bergelson (University of Pennsylvania, USA)
Teodora Gliga (Birkbeck, University of London, UK)

Discussant

Lila Gleitman (University of Pennsylvania, USA)

Much of the recent work on word learning in infancy concerns associative mechanisms and highlights the human mind's ability to learn word-object pairings presented in sparse visual settings, with contrasting cohorts, and following multiple exposures (e.g. Yu and Smith 2008). In contrast, this symposium highlights research that suggests that some simple cross-situational associative mechanisms may be insufficient for the kind of real-life word-learning that takes place in infancy and childhood, and that referential understanding may play a larger role than has been supposed.

The first paper discusses ERP findings showing that 9-month olds are sensitive to semantic violations when these occur in a live-communication situation: mothers' actively mislabeling referents leads to N400s in infants. The second paper builds on previous work showing that young infants know many nouns, and provides evidence that 8-10 month olds know verbs, greetings, and exclamations as well, which in turn suggests that young infants have either a mechanism for associative learning over abstract features, or more social-interpretation skills than have previously been attributed to them. The final paper discusses word-learning in toddlers, and provides evidence that associative mechanisms alone do not support word-learning in Autistic toddlers, and that ostensive feedback helps toddlers retain new word-referent mappings; these findings suggest constraints on word-learning that both prevent incorrect mappings and utilize social information in the formation and retention of new mappings.

Collectively, these papers suggest that very early word learning is sophisticated and that young children absorb complex social information from their surroundings. In the first year or life infants learn words for many kinds of referents, and do so without relying solely on

the kind of paired-stimulus associative learning prevalent in other domains of cognition and in other species. We will discuss the implications of this work for the formation and contents of the early lexicon, and for the development of human cognitive capacities more generally.

ERP Evidence of Referential Word Understanding in 9-Month-Old Infants

Eugenio Parise and Gergely Csibra

Cognitive Development Center, Central European University, Budapest, Hungary

Early word learning in infants relies on statistical, prosodic, and social cues that support speech segmentation and the attaching of meaning to words. It is debated whether such early word knowledge represents mere associations between sound patterns and visual object features, or reflects referential understanding of words. By using event-related brain potentials, we demonstrate that 9-month-old infants detect the semantic violation when an object appearing from behind an occluder does not match the label their mother introduces it with. The N400 effect has been shown to reflect semantic priming in adults, and its absence in infants has been interpreted as a sign of associative word learning. By setting up a live communicative situation for referring to objects, we demonstrate that semantic priming also occurs in young infants. This finding suggests that word meaning is referential from the outset, and it drives, rather than results from, vocabulary acquisition in humans.

6-11-month-olds' Comprehension of Concrete and Abstract Words

Elika Bergelson and Daniel Swingley

University of Pennsylvania, USA

Recent work on "cross-situational" word learning has reinvigorated discussion of how infants learn words. Most studies have focused on concrete-object labels taught in the lab. Here, we tested infants' knowledge of verbs, greetings, and exclamations learned through ordinary daily experience, with no in-lab training.

Infants (n=29, M=9.6 mo., range=8.2-10.9 mo.) sat on their parent's lap facing a screen displaying two videos. The parent labeled one video on each trial. Parents could not see the videos and were prompted over headphones. Seven yoked pairs (allgone-hi, eat-hug, kiss-dance, more-splash, smile-drink, uhoh-bye, and wet-sleeping) were presented. Infants' eyegaze was monitored. Most infants (17/29) looked at the correct video more than the incorrect one, a result that held for 6/7 item-pairs. Target fixation exceeded chance levels (one-tailed Wilcoxon Signed-ranks test, $p < .05$ over item pairs and over subjects); thus, infants demonstrated some understanding of the tested words.

Words like "uhoh" lack consistent visual features, yet infants generalized from their previous experience to our stimuli. This suggests that early word learning involves complex, flexible linkages between words and referents, and that two possibilities need to be considered: one, that infants are associative learners but that the features being associated are more abstract than usually supposed; two, that non-concrete words are learnable because infants already appreciate adults' referential intentions, allowing infants to transcend the perceptually obvious.

Carefully Learning Words

Teodora Gliga

BASIS Team (Mayada Elsabbagh, Rachael Bedford, Kristelle Hudry, Tony Charman, Mark Johnson)

Centre for Brain and Cognitive Development, Birkbeck, University of London, UK

The existence of different possible word learning mechanisms, whether *or not* they rely on communicative and referential cues, would be very good news for individuals lacking social skills, like children with autism. Autistic children are quite proficient at learning associatively and their unusual use of words has frequently been seen as a result of accidental incorrect word-world mappings. In an experimental eye-tracking study we showed that word learning proves to be difficult for these children even when the conditions for associative learning of word-object pairs are met (i.e. when they were looking at an object someone was naming). While it is possible that increasing the number of repetitions might have led to better learning, these findings do suggest that in real life word-learning situations associative learning is not an option for acquiring words. In another study we show that correct referent selection, while necessary, is not sufficient for word learning, either. Only after receiving ostensive feed-back about their choices did toddlers remember a new word five minutes later. Set in different word-learning contexts both of these studies show that fast-mapping is not easy-mapping. I propose that learning constraints are in place that are both

'protective' - preventing children from incorrect word mappings and facilitative – allowing the association of events whose temporal, spatial or causal relationship is not straightforward – as is the case of words and their referents. I will speculate on the nature of these mechanisms.

RS-004

EARLY GRICEAN PRAGMATICS**Organizer**

Nausicaa Pouscoulous (University College London, UK) & Cat Davies (University of Leeds, UK)

Participants

Cat Davies (University of Leeds, UK)

Frauke Berger (University of Potsdam, Germany)

Nausicaa Pouscoulous (University College London, UK)

Recent developmental research on social cognition indicates that pragmatics plays a grounding role in the development of children's communicative skills even before they utter their first words (see the work by Csibra, Gergely and colleagues, and by Tomasello and colleagues, summed up in part in Tomasello 2008). Furthermore, much evidence in language acquisition suggests that young children could not learn to speak (i.e., understand and produce words as well as syntactic structures) without impressive pragmatic abilities (e.g., Tomasello 2003; Bloom 2000; Clark 2003). In stark contrast with this picture, linguistic pragmatic inferences (e.g., implicatures, metaphors, presuppositions and irony) appear to develop later than other linguistic abilities. Our symposium tries to reconcile the development of these two types of pragmatic abilities by presenting new data on three linguistic pragmatic phenomena with which children fare better than was previously thought: presupposition, metaphor and informativeness (e.g., scalar implicatures).

According to pragmatic theories (e.g., Grice, 1975/1989; Sperber & Wilson, 1986/1995), inferences involved in understanding various types of implicit and non-literal meanings require (a) intention reading, (b); taking into account common ground (or mutual knowledge), (c) and at least some degree of cooperation. Empirical findings suggest that prelinguistic children already master these skills. Several studies have shown that infants see others as intentional agents (Gergely et al., 2002), that they recognise (communicative) intentions (Behne et al., 2005a; Behne et al., 2005b) and that even 2-year-olds pay attention both to informative and communicative intention (Shwe and Markman, 1997). From 14 or 18 months of age, toddlers take into account the common ground between them and their interlocutor in a communicative context (e.g., Moll et al., 2008; Liebal et al., 2009). Finally, toddlers have been shown to be helpful and cooperative (e.g., Warneken & Tomasello, 2006). Words and syntax, it seems, are all there is left to learn for children to become perfect little 'Gricean' comprehenders, and to understand implicatures, metaphors and presuppositions.

Yet, prior research on these phenomena suggest otherwise. For instance, expressions giving rise to scalar implicatures (e.g., *some*) appear to be given a literal – logical – interpretation by children until fairly late (9 to 11-years-old); *some* is understood as compatible with the stronger term, *all*, rather than excluding it as adults do (Noveck, 2001). Similarly, non-literal expressions tend to be interpreted literally by younger children (see, Winner, 1988/1997, Nippold, 1988/1998 and Gibbs, 1994, for a review). Finally, presuppositions triggered by additive particles such as *too* or *also*, do not seem to be taken into account by younger comprehenders (Bergsma, 2006). We will present evidence showing these pragmatic phenomena might be understood much earlier than prior results suggest, and that several factors – independent of children’s pragmatic abilities *per se* – may explain children’s apparent struggle with pragmatic inferences. The first presentation will focus on the development of referential informativeness, the second on 3-year-olds comprehension of the presupposition linked to the German particle *auch* (‘also/ ‘too’), and the third talk on metaphor understanding by 3-year-olds.

The Development of Referential Informativeness

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To refer to entities in the world, speakers must select specific referring expressions (REs) from those available in their language. Children must learn to provide enough information to refer uniquely (e.g. ‘the ball’ in the presence of two balls), but not so much as to convey unnecessary or irrelevant information (e.g. ‘the ball that’s round’ in the presence of a single ball) (Dickson, 1982; Matthews et al, 2007). As hearers, they must enrich such non-optimal forms to interpret the speaker’s communicative intention (Grice, 1975/1989; Sedivy et al, 1999; Sperber & Wilson, 1986/1995).

We present three studies which investigate children’s growing awareness of optimal REs and the communicative intention behind violations of pragmatic informativeness.

Firstly, using both under- and over-informative utterances, we investigate whether 3- and 5-year-old comprehenders try to rationalise speakers’ utterances and seek further information to restore the felicity of the utterances they hear. Reaction-time, gaze-checking and verbal responses reveal that whilst 5-year-olds show sensitivity to the infelicity of both types of violation, 3-year-olds show limited sensitivity only to the infelicity of under-informative utterances.

A second study measures 5-year olds' off-line responses to non-optimal utterances and also monitors the levels of informativeness in their own REs. Although children penalise both under- and over-informative utterances, they frequently under-inform as speakers. The third study uses a similar methodology to investigate this type of pragmatic sensitivity in children with Specific Language Impairment. Preliminary data suggest that this population is less sensitive to under-informativeness than typically-developing controls and also produces more under-informative expressions.

Children's Comprehension of Sentences with the Presupposition-Triggering Particle *auch*

Frauke Berger and Barbara Höhle

University of Potsdam, Germany

Children up to school age have been reported to perform poorly when interpreting sentences containing *only* and *also* by ignoring the meaning contribution of the particles. Previous studies indicate that this phenomenon is less pronounced for *only* (Bergsma, 2002) than *also* (Matsuoka et al., 2006; Hüttner et al, 2004; Bergsma, 2006) in various languages.

We argue that this asymmetry is related to the presuppositional status of *also*. However, we do not assume that children generally have problems considering the *also*-triggered presupposition in sentence interpretation. Rather, we argue that testing the comprehension of *also*-sentences requires certain methodological needs which were not fulfilled previously. In particular, children's target-like comprehension of *also*-sentences may be unmasked when an experimental technique with high ecological validity is used.

Using a paradigm inspired by Papafragou & Tantalou (2004) we tested 3- and 4- year-olds in an experimental setting that guaranteed a strong discourse embedding of test sentences, and where the understanding of *auch* was not measured by the detection and evaluation of presupposition failures. Children decided whether to reward a toy animal who had to do two things and only got a reward if he did both. For instance, a lion had to eat a banana and an apple. When asked *Lion, you've surely eaten the banana!*, he answered in one of three ways:

	<i>also (auch)</i>	
<i>I've</i>	∅	<i>eaten an apple.</i>
	<i>only (nur)</i>	

With this design 3-year-olds' performance with *nur* and *auch* was already very good. Hence they can consider the presupposition triggered by *auch* in their interpretation.

Early Birds: Development of Metaphor Comprehension

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¹University College London, UK

²Max Planck Institute for Evolutionary Anthropology, Leipzig, Germany

Metaphor development was investigated extensively in the 1970s and 1980s, with the conclusion that children do not understand metaphors until fairly late in development. Yet, these findings might be better explained by various confounding factors rather than reflecting children's poor pragmatic abilities. Such factors include mixing idioms with live metaphors, limited world knowledge and the difficulty of metalinguistic tasks. Indeed, school-aged children's performance with metaphor improves when the task is not metalinguistic (see, e.g., Pearson, 1990 and Waggoner & Palermo, 1989).

We believe there is no *a priori* reason to think young communicators do not master the cognitive processes enabling the comprehension of metaphors extremely early on. A late acquisition would also be surprising given recent research into their abilities with other pragmatic phenomena (e.g., scalar implicatures).

To assess children's cognitive capacities to understand (not explain or paraphrase) metaphors, we investigated how 3-year-olds fare with fully novel metaphors corresponding to their world knowledge and linguistic competences using a behavioural choice paradigm. In a game, participants had to give the experimenter one of two objects referred to by a metaphorical expression. For instance, a child was shown two towers - one with a pointy roof and no balcony, another one with a flat roof and a balcony - and was asked to hand "the tower with the hat". Unlike what previous literature suggests, our results indicate that 3-year-olds are able to understand novel metaphors that are appropriate for their vocabulary and world knowledge, based on action measures rather than metalinguistic responses.

RS-005

BECOMING AN ARTEFACT EXPERT: INDEPENDENT PROBLEM SOLVING AND CONVENTIONAL WISDOM**Organizer**

Sarah R. Beck and Nicola Cutting (University of Birmingham, UK)

Participants

Andrew Simpson (University of Essex, UK)

Margaret A. Defeyter (Northumbria University, UK)

Lara A.N. Wood (Durham University, UK)

Sarah R. Beck (University of Birmingham, UK)

We know that human beings surpass other species in terms of the number and variety of tools and artefacts we use every day. Furthermore, children rapidly become sophisticated artefact users, apparently absorbing easily from others how to use the pre-made objects they find around them. Being part of an artefact rich culture involves two distinct aspects of physical cognition: first at some critical points individuals must innovate novel tools to solve the problems they face. Second, to avoid reinventing the wheel we must learn from others how to use these tools. Thus, there is a tension between our own innovation and conventional wisdom. Our symposium explores this tension. We address new questions about how children learn about artefacts and tools, focussing on the interplay between self-generated and other-provided information about tools and other artefacts.

In our first talk Simpson and colleagues address an important gap in the current literature – concerning what young children (3- to 8-year-olds) know about the artefacts that surround them, their functions and the actions needed to employ them. Their findings complement the evidence that children are quick to learn from others' demonstrations as from 3 years of age children are shown to have an extensive and rich 'artefact lexicon'. Defeyter and colleagues explore what happens when this conventional knowledge comes into conflict with unconventional uses. Their findings suggest that 3- and 4-year-olds are more flexible than previously thought about what actions are permissible.

Wood and Beck take on the other side of the problem: innovation. Wood and colleagues allowed some children to devise their own methods to solve an action puzzle task. Other children were given a demonstration of a solution on their first encounter with the puzzle. Children were also exposed to another person's divergent technique. Their findings suggest that children can combine their own experience with that provided by others to identify solutions to physical problems. Finally, Beck et al. report on our developing understanding of children's ability to make their own tools. They review evidence that until 8 years of age children are remarkably poor at innovating their own tools. They report that

given instruction children can adapt their ability to make a specific tool to another situation, however, this transfer is limited and does not lead to domain general innovation.

Overall, our talks bring together evidence on social leaning and individual problem solving to highlight the need to explore more critically the question of how children become expert tool users. In order to understand the artefact rich human world we need to balance children's developing abilities to learn from others, innovate for themselves, and integrate what they learn from both types of experience.

When do Children Learn the Knowledge Needed to use Artefact? Development of the Artefact Lexicon.

Andrew Simpson¹, Kevin J. Riggs² and Katarzyna Kostyrka¹

¹ University of Essex, UK

² University of Hull, UK

In 'modern' artefact-dense cultures, human artefact use is essentially restricted to the ability to use familiar artefacts made by someone else. Adults in these cultures must store information on how to use many artefacts, probably hundreds. Development of this ability will entail the acquisition of an 'artefact lexicon' in which this 'knowledge-for-use' is stored. Two aspects of knowledge-for-use were investigated for a sample of everyday domestic artefacts – function ('what it's for') and action ('what you do with it') – using comprehension tasks developed for this purpose. Data from Experiment 1 (n=89) suggested that children acquire this knowledge-for-use rapidly in early childhood. Moreover, data from Experiment 2 (n=40) and Experiment 3 (n=20) suggested that 3-year-olds know the functions and actions associated with those artefacts that they can name. It appears that young children are prodigious learners of the basic knowledge needed to use the artefacts they encounter at home. The questions of how and why they do this are briefly addressed.

Young Children's Reasoning of Artifact Function Across Different Contexts: an Action-Protest Paradigm

Margaret A. Defeyter¹, Joanne Underwood¹, and Tamsin C. German²

¹ Northumbria University, UK

² University of California, Santa Barbara, USA

An essential part of everyday life is the way in which people interact with human-made objects. In a recent study, Casler et al. (2009) found that toddlers protested to a puppet using an object in an atypical manner following demonstration of the conventional function. However, the order of function demonstration was not counterbalanced, hence it is not clear whether toddlers were protesting to objects being used in an atypical manner; or merely protesting to the puppet not following the 'rules of the game'. To investigate these

two hypotheses, 41 3-year-olds and 39 4-year-olds were randomly assigned to one of the four function conditions (conventional-idiosyncratic, conventional-instrumental, idiosyncratic-conventional, and instrumental-conventional).

In each condition, a puppet used an object for a specific function, and then a second puppet used the object in a different way to the modelled function. Children's protests to each object use were recorded. Three and four-year-olds showed similar levels of overall protest to the second function demonstrated across all conditions. Children only protested to the first demonstrated function in the idiosyncratic-conventional condition. However, following this protest, these children showed significantly higher levels of protest to the second function demonstration. These findings are discussed in terms of normativity and context.

Copy you or Copy me: The Effect of Prior Personally-Acquired Information on Artefact use

Lara A. N. Wood, Rachel Kendal and Emma Flynn
Durham University, UK

This study investigated the role of a child's prior personally-acquired information on a novel artefact on their subsequent imitation of causally relevant and irrelevant actions presented during a later demonstration. One-hundred and sixty 5-year-old children interacted with an artificial fruit, two-action puzzle task, which could be opened by one of two methods to extract a reward. Initially, a child received either a demonstration using one of these two methods to extract the reward or witnessed no demonstration. The child then attempted the task. Following this first trial, the child either received no information, information that used the alternative method to the one s/he used, used the same method, or for children who were unsuccessful in discovering a method for themselves, demonstrated a method. Children were then given a further two trials. Among our many findings we found that the demonstration of an alternative method led to children alternating between the two methods for their remaining trials. If children received agreeing or no further information their behaviour was 'canalised', using the same method. Additionally prior personal information reduced the replication of irrelevant actions ('overimitation'). The results suggest that when learning about artefact use children's social learning strategies are flexible and can be mediated by prior experience.

Making Tools: Problem Solving and Transferring Knowledge

Sarah R. Beck, Nicola Cutting, Ian A Apperly and Jackie Chappell

University of Birmingham, UK

Young children are expert tool users, yet until recently we knew little about their abilities to make their own tools. In a task borrowed from the comparative literature (Weir, Chappell, & Kacelnik, 2002) children under the age of 5 found it near impossible to innovate a simple hook tool from a straight pipecleaner to retrieve a bucket from a tall tube (Beck, Apperly, Chappell, Guthrie, & Cutting, 2011). It was not until children were 8 years old that the majority innovated a tool. However, once shown a demonstration of how to make the tool children of all ages found it trivially easy to manufacture their own tool. We will explore what is difficult about innovating tools by examining children's performance once they have succeeded on one task. We report that having made one tool (either independently or following a demonstration) did not confer any benefits on a subsequent task where the solution was to make a different type of tool. However, success making a particular type of tool (e.g. a hook) did improve performance on a second trial in which the type of tool needed was the same, despite the surface features differing. We will discuss the implications of these data for our understanding of what makes tool innovation difficult.

RS-006

THE ELEMENTS OF FAIRNESS

Organizer

Keith Jensen (Queen Mary, University of London, UK) & Peter R. Blake (Harvard University, USA)

Participants

Peter R. Blake (Harvard University, USA)
Martina Wittig (Max Planck Institute for Evolutionary Anthropology, Germany)
Katherine McAuliffe (Harvard University, USA)
Keith Jensen (Queen Mary, University of London, UK)

Sensitivity to fairness is an important part of cooperation in human societies (Tomasello, 2010). Aversion to disadvantageous inequity – sensitivity to being worse off than others – can motivate people to restore equity (Fehr & Schmidt, 1999). Perhaps more importantly for cooperation is advantageous inequity aversion, being attuned to norms of fairness, even when it means giving up something to benefit others. Recent work on children, as well as other species, is enriching our knowledge of the importance of fairness in sociality. Papers presented in this symposium will summarise some of the latest work on the development of fairness.

Theories and methods from game theory and experimental economics are being fruitfully applied to children as well as nonhuman primates. The chief advantages of the economics approach are that these tests are minimally (or even completely) nonverbal, and the motivational stakes are high since valuable goods, such as food and stickers, are on the line. Game theory makes clear, testable predictions, and importantly, allows us to elucidate something of the social preferences underlying the choices children make. These preferences can be positively other-regarding, having the welfare of others as the primary goal, but they can also be negatively other-regarding, being motivated toward the suffering of others. The talks in this symposium take these approaches to measure fairness preferences in children.

The first presentation uses the dictator game to determine the sharing behaviour of children from 3 to 8-years-of-age. Of particular importance is that this is the first study of its kind to be applied to children outside of the typical, Western populations, allowing us see the role of cultural norms in shaping fairness preferences (see Henrich et al., 2010). The second study presents data from an ultimatum game, as well as a dictator game with reciprocity in 5-year-olds. The former game probes the sensitivity to unfair outcomes and the intentions behind them, as well as the degree to which children strategically take this into account; the latter game examined the sensitivity to whether resources were taken,

rather than given, and the generosity of the partner. The third talk presents a novel game, the inequity game, to test disadvantageous inequity aversion in children. Children can spitefully prevent other children from faring better, even though doing so comes with a cost. The final talk considers the possible psychological underpinnings of fairness sensitivity. The proposal is that social concerns motivate social decisions. Positive social concerns can motivate acts of altruism, negative social concerns can lead to acts of punishment and spite. Both of which are cornerstones of cooperation and sociality. Evidence from studies of spite and third-party punishment in 5-year-old children and chimpanzees will be taken into consideration.

Altruism, Fairness and Social Learning: A Cross-Cultural Approach to Imitative Altruism

Peter R. Blake¹, Tara C. Callaghan², John Corbit² and Felix Warneken¹

¹ Harvard University, USA

² St. Francis Xavier University, Canada

Norms for distributing resources are crucial for maintaining cooperation within a culture (Henrich, 2004). Recent research using economic games has shown that such norms vary greatly across cultures and, therefore, must be learned to some extent (Henrich et al., 2005, 2010; Herrmann, Thoni & Gächter, 2008). This presentation examines the mechanisms that underlie social learning about altruism and fairness in two cultures: the US and India.

We used a simple economic game, the Dictator Game (DG), to test intergenerational (parent to child) transmission of sharing behavior. Parents were asked to model a particular division of 10 resources between themselves and an absent recipient. For example, parents in the Generous model condition were asked to give 9 and keep 1 and in the Selfish model condition to give 1 and keep 9. Children (3- to 8-year-olds) observed the parents in these conditions but did not see the parent's division in a control condition. Children then played a DG in private.

In the USA (N = 163), children's donations were significantly influenced by the Selfish model ($p = .016$) but not the Generous model. Donations were limited by a fairness norm of an equal split. In India (N = 154), both models influenced donations: Selfish, $p < .001$ and Generous, $p < .01$. Exact imitation was far greater in India than the USA. These findings suggest that different cultures prioritize different forms of social learning about altruism and fairness.

The Role of Other's Intentions in Resource Distribution

Martina Wittig¹, Keith Jensen² and Michael Tomasello¹

¹Max Planck Institute for Evolutionary Anthropology, Germany

²Queen Mary, University of London, UK

Sensitivity to unfairness is not only tuned to outcomes; it also appears to be sensitive to the intentions the lead to them (Falk & Fischbacher, 2006). Little is known about the ability of children to evaluate outcomes and intentions when making fairness judgments. We used a mini-ultimatum game and a reciprocal dictator game to determine how children evaluate fairness.

In the first study, 32 pairs of 5-year-old children played the mini-ultimatum game in which unfair distributions (3/1) were paired with alternatives. The first player (proposer) could offer one of the allocations to the second player (responder) who could then either accept or reject it. Rejection resulted in both players receiving nothing. Proposers adjusted their choices, namely making fair (2/2) offers more than unfair (3/1) offers relative to a nonsocial control ($p = 0.022$). Responders only rejected offers of 3/1 when the alternative was equitable (2/2; $p = 0.031$), but not when other alternatives had been available.

In a second study, 5-year-olds ($N = 72$) played a reciprocal dictator game with a puppet which either gave resources to them or took resources from them. Children could then reciprocate. In both cases, children received the same amount of resources. Children reciprocate more generously when the puppet gave half of her resources than when she took half of the child's resources ($p = 0.011$) and if the puppet was generous (took less/gave more than half, $p = 0.039$). Both studies suggest that 5-year-olds can, to some extent, take their partner's intentions into account.

Inequity Aversion in Children: The Importance of Outcomes and Audience Effects

Katherine McAuliffe, Peter R. Blake and Felix Warneken

Harvard University, USA

Inequity aversion (IA) is an important component of the human sense of fairness and adults are willing to sacrifice personal gain in order to prevent inequity. An aversion to disadvantageous inequity (I get less than you) is understandable in terms of relative

outcomes. However, advantageous inequity aversion (I get more than you) is less well understood and appears to be uniquely human.

Recent research found that children 8 years of age, but not younger, were willing to sacrifice advantageous offers (Blake and McAuliffe, 2011). This presentation explores this phenomenon in more depth with two studies using the same simple economic game, the Inequity Game, where children can accept or reject offers of candy. Study 1 tests the importance of the origin of procedure used to deliver the offers (i.e. a random or intentional process). Study 2 tests whether children reject advantageous inequity in a nonsocial version of the game. Together, these results demonstrate that children reject advantageous offers no matter how they are delivered but only in a social context.

Punishment and Spitefulness: Cooperation's Dark Heart

Keith Jensen

Queen Mary, University of London, UK

Punishment has been proposed as an important mechanism for maintaining cooperation by deterring exploitation (Clutton-Brock and Parker, 1995; Boyd & Richerson, 1992). However, little is known about the development and evolution of punishment, less about its underlying psychology. In this presentation, I will consider how recent empirical work with children and chimpanzees suggest the importance of negative social concerns in maintaining cooperation in humans.

Of particular importance are third-party and altruistic punishment. These forms of punishment are less likely to have self-regarding motives and might play a central role in maintaining cooperation in large groups. They might be motivated by punitive and moral sentiments, including a sensitivity to norms of fairness. But they may have, at their core, spiteful motives, namely the misfortunes of others. These negative social concerns likely share a common root – sensitivity to the welfare of others – as positive social concerns.

Five-year-olds pay a cost to punish unfair distributions of resources (Wittig et al., under review) and they punish third-party violations (Riedl et al., in prep). In light of other work (e.g., Rakoczy et al. 2008; Blake & McAuliffe, 2001), it is clear that children will punish violations, even if they do not stand to benefit, a result that contrasts data on chimpanzees (Jensen et al., 2007a,b; Riedl et al. under review). It may be that a concern for the welfare of others – both positive and negative – may form the emotional heart of human cooperation and competition.

POSTER SESSION A

A-001

TRACX: A new connectionist model of statistical learning. (Now with added web simulator)

C.Addyman, R.M.French and D.Mareschal

Birkbeck, University of London, U.K.

Statistical learning is an important prerequisite for language learning in infancy (Aslin, Saffran & Newport, 1998). Similar skills underlie adult sequential and implicit learning. French, Addyman & Mareschal (2011) presented a single model of both these abilities. The Truncated recursive autoassociative chunk extractor (TRACX) outperforms PARSER (Perruchet & Vintner, 1998) and the simple recurrent network (SRN; Cleeremans & McClelland, 1991) in matching human sequence segmentation data. The mechanism relies on the recognition of previously encountered subsequences (chunks).

We describe the TRACX model and present new simulations of infant data. Kirkham, Slemmer & Johnson (2002) habituated infants at ages 2, 5, and 8 months old to a sequence of visual looming shapes and found a preference for a more random sequence at test in all ages. Marcovitch & Lewkowicz (2009) used the same procedure but independently varied conditional probability and pair frequency information. In that study 4.5- and 8.5-month-old infants showed a preference but 2.5 month olds did not. We show that a developmental version of the TRACX network can capture this difference in performance between these two studies.

We also present a web-based simulator that makes the model more widely accessible to the research community. The simulator runs inside a browser window with all code executed locally on user's computer. This approach to simulation provides a useful pedagogical resource and demonstrates a valuable new method for disseminating new connectionist models in a more open and accessible fashion.

A-002

Learning to perceive time: A connectionist, memory-decay model of infant interval timing

C.Addyman, R.M.French and D.Mareschal

Birkbeck, University of London, U.K.

Interval timing concerns our ability to judge, compare and reproduce time estimates for durations shorter than a few minutes. Traditional theories posit a set of innate pacemakers-accumulators that work like stopwatches (Gibbon, 1977). These theories take no account

of the problem of starting a separate stopwatch for every event that might later require a time estimate nor how experience could improve timing ability. We believe that timing ability is learned and is an ability that develops during infancy. Moreover, we believe that early timing abilities are grounded in early motor activity and that time estimates are based upon decaying memory traces for recent events.

We present the first developmental model of interval timing. It is a memory-based connectionist model of how infants learn to perceive time. It has two novel features that are not found in other models. First, it uses the uncertainty of a memory for an event as an index of how long ago that event happened. Secondly, embodiment – specifically, infant motor activity – is crucial to the calibration of time-perception both within and across sensory modalities. We describe the model and present three simulations which show (1) how it uses sensory memory uncertainty and bodily representations to index time, (2) that the scalar property of interval timing (Gibbon, 1977) emerges naturally from this network and (3) that motor activity can synchronize independent timing mechanisms across different sensory modalities.

A-003

Neural correlates of referential gaze perception in infants and adults

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Department of Neuroscience and Imaging, University of Chieti-Pescara, Italy

The neural processing of eye-gaze relations was investigated by Senju, Johnson and Csibra (2006) in a pivotal work. Using a congruent-incongruent gaze shift paradigm, they found a posterior component elicited both in 9-month-old infants (N290) and adults (N330), that was greater in incongruent than congruent condition. In infants only, they found N200 and N400 anterior components, which, in contrast, were larger for congruent than incongruent condition. According to the authors, the posterior component is related to the encoding of gaze direction, whereas the function of the anterior components is more difficult to interpret. They suggested to refer those components to the detection of socially relevant signals during communication. In order to extend the above results, we also recorded ERPs from two groups of adults (N=15) and nine-month-old infants (N=11), respectively. We used the above experimental paradigm as well; however, following the Senju et al.'s suggestion, we employed real and dynamic instead of computer stimuli. We argued that a live-interactive paradigm would enhance the social significance of the context both for adults and infants, due to the richness of communicative cues (eyebrow raise with accompanying smile during mutual gaze), so representing a more eligible paradigm than the usual for recording the anterior components. Preliminary analyses on three infants showed the greater amplitude of the posterior N290 in incongruent than congruent condition, and the greater amplitude of both N200 and N400 anterior components in the latter than the former condition, so fully confirming previous results.

A-004**Referential listening of Greek preschool children and exposure to play and learning experiences in the school and family environment****K. Antonopoulou² and S. Kouvava²**¹Harokopio University, Athens, Greece²Local Education Authority, 4th Division of Athens, Greece

Effective listening in the classroom context entails skills such as constant monitoring of ongoing information, continuous integration of new information to already existing relevant knowledge and application of effective strategies, such as asking appropriate questions, to maintain comprehension (Flavell, 1990, 1993; Lloyd, 1997). This kind of listening is not the same as listening in the supportive familial environment. The present study explores the role of exposure to play and learning activities in school and the family context to preschoolers' ability to respond effectively to oral messages as listeners. The sample consisted of 43 children recruited from 3 nursery schools of two urban areas of Greece. The mothers (n=43) and the teachers (n=12) of the participating children were also involved in the study. Children's referential listening skills were assessed with the adjusted to Greek reality Listening Skills Test (Lloyd et al., 2001). Mothers and teachers responded to a questionnaire which evaluated children's exposure to play and active learning activities within the school and family environment. The results revealed that child exposure to play and learning activities in school and at home may be good predictor of referential listening competence. Findings expand previous evidence attesting to a link between comprehension monitoring and other aspects of linguistic, cognitive and psychosocial development in young children.

A-005**Children's picture interpretation: Appearance or Intention?****E. Armitage and M. Allen**

Psychology department, Lancaster University, Lancaster, UK

Pictures represent real world objects and as such are symbolic. How children understand this picture-referent relationship is an area of contention for developmental psychologists. Some theorists argue that children interpret and name pictures according to their appearance, thereby following a realist route to picture interpretation. Others challenge this view, arguing that children follow an intentional route taking into consideration the artist's intention in producing a picture. These competing possibilities were investigated using two independent samples of 4-6 and 4-7 year old children. Forty-eight children took part in a photograph task and 45 in a line drawing task. Each study had two conditions and involved children being presented with 4 trials of 3 familiar coloured objects. In each array the

experimenter photographed or drew one object. In the colour change condition the pictures presented to the child depicted a different colour referent to that originally photographed or drawn. In the black and white condition, the pictures were simply black and white. Three questions were asked in each trial: what is this picture of?, can you pass me this? and what did I mean to take a picture of? Children were more likely to adhere to intentional cues in the black and white condition and appearance cues in the colour change condition. The results indicate that young children use both appearance and intentional cues to interpret pictures. Crucially, the circumstances under which they employ these cues differ according to level of cue conflict, question type, question order, and to some extent age.

A-006

The understanding of goal-directed actions in young children: Disentangling the role of goal identity and goal location

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Previous research has shown a dissociation between different measures used to investigate infants’ action understanding. Already 6-month-olds attribute the goal of an observed action to an agent based on the goal identity (measured via looking times; Woodward, 1998). In a similar task, infants predict the agent’s behavior based on the goal location. Predictions based on the goal identity develop not until the age of 3 years (Daum et al., 2011). In this previous study, children were familiarized with both the identity and the location of the agent’s goal. This might have biased the predictions of the younger children towards the goal location. Therefore, in the present study, the saliency of the goal location was reduced. Nine-month-olds were habituated to an animated agent moving to one of two goal objects. In the test phase, the two goal objects were moved from their original to a new position on the display. In the test phase, the agent either moved to the old goal, to the new goal or to the old path. In line with previous findings, infants showed longer looking times in the old path and new goal conditions compared to the old goal condition. In contrast, the infants’ predictions did not differ from chance. Furthermore, 24-month-olds predominantly showed identity-related predictions. Thus, looking times and predictions are still dissociated in this paradigm. However, reducing the saliency of the goal location helps already 2-year-olds to predict an agent’s behavior based on the goal identity.

A-007**The benefit of increased comparison and contrast in novel objects categorization across development****L. Augier and J.P. Thibaut**

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We investigated how children may use either within or between category comparisons, independently or in combination, to generalize novel names for novel objects on a non salient dimension: texture rather than shape. Our approach was interested in how comparison situations are constraint. We pitted a texture match against a shape match and we manipulated the quantity and the source of information (positive or negative evidence). Our experimental design crossed three factors: number of standards (one, two or four), presence of contrast (zero or one) and age (37-59 months old children or 59-77 months old children). For each experimental condition, at least one of the standards was a shape match and a texture match, and the others (if any) were only texture matches. The contrast object was only a shape match. Our results support the idea of a major role for within category comparisons in choosing the texture. Further, older children performed significantly better than younger children only when there were four standards. Hence, increasing the load of comparison does not hinder but may be of more help for older than for younger children. We also found a beneficial effect of contrast but only when there was only one standard. This means that between category comparisons may play a role in generalizing along a non salient dimension, for the younger as well as for the older children, but this role appears secondary to within category members comparisons.

A-008**Language and Suggestibility: Evidentials in Turkish children`s selective learning****C. Aydin**

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Recent surge of interest in the sorts of ways children evaluate others as credible sources of information center on cues such as speaker accuracy, age, expertise. Another term for selective learning -especially in forensic contexts- is suggestibility. The current research combines two of the cues that influence selective learning: (1) language, and (2) speaker`s informational access. The study focus on Turkish-speaking children`s sensitivity to grammatical source cues -evidentiality markers- in actively resisting conflicting information. With a suggestibility paradigm, we found that young Turkish-speaking children (ages 4 and 6) differentiate between markers of direct perceptual access and markers of indirect

knowledge when exposed to misinformation. The results contribute to our understanding of how language is related to social cognition, and particularly how local grammar sensitizes speakers to cues of credibility of information, such as information access.

A-009

Narrative language in Lithuanian preschoolers

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The presentation deals with the main micro- and macrostructural indications of Lithuanian preschoolers' narratives, which appear to be one of the most relevant criteria of general language and cognitive development and can be used as a language screening tool. The analysis is based on an experimental data of 24 Lithuanian typically developing monolingual children (6-7 years age) from middle class families, attending a state kindergarten in Kaunas (Lithuania). During the investigation, a semi-structured elicitation method was applied. The children were tested individually; they were asked to tell a story according the Cat Story (Hickmann 1982) picture sequence. The stories were recorded, transcribed and annotated for an automatic analysis using CHILDES (Child Language Data Exchange System, MacWhinney 2010) tools. During the analysis, the main microstructural characteristics (syntactic complexity, lexical diversity, and general productivity (MLUw, type/token ratio)) as well as general macrostructural characteristics (structure, expression of the main idea, and coherence) of the stories were investigated. The results lead to a general conclusion, that narrative language skills are completely (or almost) acquired at the preschool age. With a few exceptions, the children demonstrated completed narrative structure and managed to express the main idea. Productivity (MLUw and type/token ratio) indexes were quite high, and semantic analysis indicated a wide-ranging lexical diversity. However, complex structures (especially causal and temporal clauses) were still difficult to produce, but even these skills seem to be partially acquired.

A-010

Pointing signals infants' readiness to learn

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Human infants appear to possess a number of cognitive biases for ensuring the efficient acquisition of culture (Csibra & Gergely, 2009; 2011). From the innate orienting mechanisms that ensure attention to potential 'teachers' (Farroni et al., 2005), to biases to

interpret communication in terms of culturally-relevant information (Yoon, Johnson, & Csibra, 2008; Southgate, Chevallier & Csibra, 2009), there are now many examples of the ways in which infants play an active role in cultural acquisition. A study by Begus and Southgate (2011), demonstrating that infants pointed to novel objects significantly more for a knowledgeable compared to an ignorant experimenter, has shown that infant pointing behaviour can also bear the function of acquiring culture and information. In the current study, we hypothesized that if infants do use pointing as a means of obtaining information, then the information received in response to their gesturing should be learned better than unsolicited information. Sixteen-month-olds were offered pairs of unfamiliar objects, held at a distance, until they expressed an interest in one of the objects by pointing to it. Subsequently, the experimenter demonstrated the function of either the object the infant had chosen or the unchosen object. After a delay, infants replicated the functions of chosen objects significantly better than the functions of unchosen objects ($t(14) = 2.256$; $p = 0.041$). These results suggest that, not only do infants point to obtain information, but that such pointing reflects a readiness to learn, and, consequently information provided in response to such requests is assimilated better than unsolicited information.

A-011

The effects of ownership and group membership on resource distribution among young children

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One question rising from studies in moral psychology refers to humans' "default moral tendency", and in particular, whether young children are "egalitarian" or "selfish" by nature. The current research addressed this question by assessing to what extent children's moral behavioral pattern is affected by "egotistic" factors (resource ownership) and "group" factors (group membership). 235 3- to 6-year olds played a dictator game. In this game, children (the "Dictator") were instructed to allocate resources (10 stickers) between themselves and another person. Two variables were manipulated to assess the co-existence of the conflicted moral behavioral patterns: (1) the 'Ownership Level' between the 'Dictator' and the resource, which varied between-subjects as Mine (the child's), Ours (the child's class), or Not Mine; (2) the recipient's 'Group identity', which varied as a within-subject variable among In-group member, Out-group, or Neutral. We found a significant effect of Ownership level, such that allocation was lower when the resource belonged to the child or his/her group. We also found an effect of Group identity, meaning higher allocation for in-group recipients over out-group ones. An interaction between these factors was also found, such that Group identity mattered when the resources belonged to the child or his/her group, but not when they did not belong to either. Finally, gender difference regarding ownership understanding is discussed. These results demonstrate that the extent to which children act in a selfish or egalitarian manner depend on both egotistic and

group considerations. Present studies are focusing on the influence of resource attractiveness and effort.

A-012

Supporting narrative development in typically-developing and autistic children using a technologically augmented playset

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Storytelling plays an important role in emotional and intellectual development, and supports learning through the sharing of experiences and mental models, but the capacity for imaginative and social storytelling is impaired in autistic spectrum conditions (ASC). Technology-based interventions for supporting the development of narrative abilities in children with ASC have so far focussed on video or computer applications, which do not provide a naturalistic social context. The Augmented Knight's Castle (AKC) is a tangible toy with embedded context-specific sound effects to encourage social play and narrative. Mature narrative is characterised by adoption of different narrative roles: in-character, narration of story, and meta-narration (suggestions for story development). Groups of children, either typically-developing (TD), or TD children paired with a high-functioning child with autism spectrum condition (ASC), played with the AKC or with a non-augmented KC and then jointly constructed a narrative. We predicted that the AKC would stimulate more mature storytelling in both TD and mixed TD-ASC groups and more connected conversation in performances than the KC. We discuss our results in relation to how social interaction can contribute to the individual development of narrativity and how such social interaction can be augmented.

A-013

Chimpanzees use principle based reasoning in understanding others

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Despite the high level of interest, the question whether chimpanzees possess Theory of Mind (ToM) functions hasn't been satisfactorily resolved. Since Premack and Woodruff (1978), remarkable methodological progress has been made, but the current paradigms

still cannot determine whether chimpanzees reason about unobservable mental states when perceiving other agents' behavior (Povinelli & Vonk, 2003, 2004). Here we will argue that Penn & Povinelli (2007) are right in that there is no compelling evidence that chimpanzees use “mental terms” but they are wrong in their claim that the current evidence suggests the hypothesis of the chimps possessing only a behavioral-rules-system based on statistical information. In fact, evidence on principle-based reasoning (possibly teleological) emerges from a wide range of otherwise uninterpretable data. Focusing on situations where statistical reasoning is either not meaningfully available or provides no relevant guidance for behavior, it is claimed that chimpanzees' responses clearly indicate a) goal understanding in a helping paradigm (Warneken & Tomasello, 2006), and b) understanding of efficiency and equifinality in an imitation paradigm (Buttelmann et al, 2007). Based upon these interpretations we can distinguish principle based reasoning from statistical inference, using paradigms which are non-competitive, ecologically not valid, open-ended, and don't operate with reinforcement. Keeping to the above methodology we created a variation of the original helping paradigm that involves having to infer the reference of the object requested and hence it requires belief attribution and mental state understanding. We present the results of a pilot experiment with children.

A-014

Variation in Parents' Pedagogical Style in Everyday Settings

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Csibra and Gergely's natural pedagogy theory, that children are adapted to learn from adults' intentional teaching, inspires intriguing experimental findings. In addition, we need better understanding of the pedagogical interactions that children encounter everyday. Two methods captured variation in parent-child interaction: (1) parents naming objects in play with children, and (2) family talk while interacting with museum exhibits . The first study compares parents' ostensive labeling with other labeling styles in conversations with young children. When naming objects in play with toddlers (12-24 months), parents' proportion of ostensive labels (e.g. “This is an otter”) was negatively correlated with children's vocabulary scores, $r(36) = -0.357$, $p < .05$. Consistent with pedagogy theory, parents may use ostension when children's speech is emerging. However, surprisingly, correlations were strongest with a set of objects likely to be familiar to children. The second study addresses individual and cultural variation in the tone of parent-child interaction, ranging from instructional to collaborative to distanced. We compared family science workshops for immigrant families from Mexico and Vietnam at a California children's museum. Vietnamese heritage parents engaged in an instructional (pedagogical) style more often than Mexican heritage parents, $t(16) = 2.85$, $p = .012$; a trend suggested more collaboration in Mexican heritage parents, $t(16) = 1.18$, $p = .088$. Ongoing analyses explore links between interaction style and children's exploration/learning. This work uncovers

complexity in how everyday interactional styles relate to children's learning, important for development of pedagogy theory.

A-015

Young Children's Inductive Reasoning About Normative Rules and Statistical Regularities

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Preschoolers can reason inductively (e.g. Gopnik et al., 2004), with much research focusing on their ability to reason about statistical regularities (Rhodes et al., 2009). Though it is known that preschoolers can also reason inductively about normative rules (Rakoczy, 2008; Rakoczy et al., 2008) less is known about processes underlying inductive rule learning and what commonalities are shared by reasoning inductively about rules vs. regularities. Here, we directly compared children's ability to attend to sample composition and social information when reasoning inductively about rules vs. regularities. Four- to 6-year-olds (N=62) observed puppets introducing apparatuses (e.g., a marble track) that always resulted in a 50/50 distribution between two outcomes (left/right bin). In the regularity conditions, puppets had no control over the outcome, implying it resulted from a statistical regularity. In the rule conditions, puppets had control over the outcome (steering the marble into a given bin). We then varied puppets' reaction to the outcome: neutral, surprise or disappointment. Children watched three demonstrations for each of three apparatuses (control/ surprise/disappointment apparatus). After the first and second demonstration, children were asked to make an outcome prediction (random /non-random) if the toy were played again under the same conditions, or following a change of apparatus (regularity)/actor (rule). The correct prediction should generally always be random except in two conditions: when a new (expert) actor plays following disappointment (rule) or when a new apparatus is used following surprise (regularity). Results suggest children show this pattern of response, drawing correct inductive inferences in a context-dependent manner.

A-016

Intuitive Statistics in Non-human Primates

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Recent research suggests human infants are sensitive to statistical information and can reason about the relations between populations, sampling processes and resulting samples (e.g. Xu & Garcia, 2008; Denison & Xu, 2009). Little, however, is known about

such intuitive statistics from the point of view of comparative psychology. This study was the first to test whether non-human primates, specifically great apes (Chimpanzees, Bonobos, Gorillas, Orang-Utans), are capable of such intuitive statistics. In experiment 1, animals were presented with two buckets containing mixed populations of banana pellets : carrots in a 1:4 and 4:1 ratio (apes had a clear preference for banana pellets, as established in a pretest). An experimenter simultaneously randomly sampled one item from each bucket, concealing the item in her hand and prompted animals to choose one item by pointing at the hand. Animals mostly (71%) chose the hand sampled from the bucket containing a higher proportion of their preferred item, more than expected by chance, $t(27) = 6.43$, $p < .001$. Experiment 2 -4 used the same procedure but varied the distribution of items in each bucket to rule out alternative explanations: Experiment 2 & 3 ruled out the possibility that animals were simply choosing a mixed population or the bucket in which the preferred item presented the majority. Experiment 4, importantly, ruled out that animals were simply relying on absolute rather than relative frequencies. Together, these results suggest that rudimentary forms of intuitive statistics are not uniquely human, but present at least in some non-human primates.

A-017

Is There a Complexity Hierarchy in Human Children's Tool Making?

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Although demonstrating vast aptitude in using and manufacturing tools (making tools following instruction), children display great difficulty in innovating novel tools to solve problems (Beck, Apperly, Chappell, Guthrie & Cutting, 2011; Cutting, Apperly & Beck, 2011). In these studies children were unable to innovate a hooked tool from a pipecleaner to retrieve a bucket from a tall transparent tube until around 8 years old (Beck et al., 2011; Cutting et al., 2011). This same difficulty was observed in a task requiring children to unbend a pipecleaner making it long enough to push a ball out of a tube (Cutting et al., 2011). These studies demonstrate children's difficulties in tool innovation via the mode of reshaping (restructuring material) and using a single material. In the present study 4-to-7-year-old children's difficulty was shown to extend to two other methods of tool making - subtracting (removing functionally irrelevant parts) and adding (combining materials), and to new materials. However, no evidence of a tool making complexity hierarchy, as suggested in the non-human animal literature, was seen. This study also introduced two stages of demonstration for the unsuccessful innovators. Success in manufacturing a tool increased with age following both levels of instruction. This demonstrates the first evidence for the development of social learning within the domain of tool manufacture. We suggest that although late developing, our ability to overcome tool innovation difficulties, and our capacity for social learning could explain how human tool behavior has advanced so far beyond our nearest relatives.

A-018**Children's expectations of social relationships based on shared accent****J. B. Dautel and K. D. Kinzler**

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Children express social preferences for individuals who speak with a native accent of their native language (Kinzler, Shutts, DeJesus, & Spelke, 2009; Kinzler & Spelke, 2007). The present research explores whether a shared accent not only guides children's own social preferences, but also informs children's inferences about others' social relationships. If so, are children's expectations of others' social relationships based on the potential for effective communication, or on shared accent as a marker of group membership? Across four experiments, 5-6-year-old monolingual English-speaking children were presented with a series of trials depicting three individuals (a target, and two potential friends of the target). Each individual was paired with a voice clip differing in language and/or accent. In the first experiment, the target spoke in French-accented English, and the two potential friends spoke in native French and native English. Children chose the French-speaker, rather than the English-speaker, as the French-accented English-speaker's friend. Subsequent experiments revealed that children expect social relationships to occur among individuals who share the same accent, even if those individuals don't communicate with meaningful semantics or grammatical structures. These findings suggest that children expect those who share an accent to also share a social relationship, even when effective communication may be hindered. We propose accent functions as a marker of the social category to which one belongs.

A-019**Somatotopic organization of sensorimotor cortex activation during the execution of arm and leg movements in 12-month-old infants****Carina C.J.M. de Klerk, Mark. H. Johnson and Victoria Southgate**

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Recent infant EEG studies have used event-related desynchronisation in the alpha frequency band (6-9Hz) to investigate functional activation of the sensorimotor cortex. Studies with adult participants have demonstrated that this sensorimotor alpha desynchronisation is somatotopically organized. As relatively little is known about the ontogeny of the somatotopic organization of the sensorimotor cortex, the present study

aimed to investigate the pattern of sensorimotor alpha desynchronisation associated with the execution of arm and leg movements in 12-month-olds (N=19). EEG was recorded while infants were encouraged to perform arm and leg movements by handing them toys to reach for and by using a mobile conjugate paradigm to elicit kicking. We identified the individual frequency range in which sensorimotor alpha desynchronisation was largest compared to baseline for each infant and compared the activity in this range for the arm and leg movements over left, central and right sensorimotor cortex electrodes. A repeated measures ANOVA with effector (arm vs. leg) and location (left, central, right electrode positions) as within-subjects factors revealed a significant interaction between effector and location, $F(2, 36) = 4.755, p = .015$. These results demonstrate that infants, like adults, display somatotopically organized sensorimotor alpha desynchronisation while performing arm and leg movements, with more activation over central channels for leg movements and more lateral activation for arm movements. These findings suggest that the somatotopic organization of the sensorimotor cortex is present by at least 12 months of age, and provide a tool for investigating the somatotopic distribution of activity during action observation.

A-020

How can children inform our understanding of exploratory learning in non-human animals?

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Piaget's view - that children learn through play and exploration - is widely accepted as being integral to cognitive development. Surprisingly few scientists, however, have systematically investigated how exploration is structured to support learning mechanisms in different situations and even fewer have studied it in non-human animals. Traditionally, the methodological approach for studying cognitive development in human and non-human animals has been very different, but a comparative approach can be very informative. We exploited the strong explorative tendencies of parrots and human children, and designed a series of comparative experiments to provide a window into the mechanisms and strategies used in causal learning. Here we focus on the human studies, where we presented a series of tasks involving novel objects and physical problems to children (aged 4 to 7 years) to examine in detail the process of exploration and play in different contexts. We found that children pay more attention and explore more when there are subtle functional changes in an object (e.g. weight) rather than non-functional changes (e.g. colour). The diversity of these exploratory behaviours increases with age. Children understand how simple physical principles govern the behaviour of objects, but here we discuss to what level this extends across development depending on the exploration strategy employed. These results will be compared to similar tests carried out on parrots.

We hope this will give us insight into how we and other animals process information in a wide range of environmental situations.

A-021

Are Preschoolers Rigid or Flexible Imitators? - The Test of Flexibility with Changing Relevance of an Action

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According to several experiments preschoolers tend to imitate actions faithfully even if it is unnecessary and inefficient (e.g. Lyons et al, 2007). Children's overimitation is remarkable considering infants' selective imitation (e.g. Gergely et al., 2002). Our aim is to show that preschoolers are not rigid but flexible imitators. In our ongoing study with 4-year-olds the model shows an action sequence with relevant and irrelevant steps and a clear goal (building a four-room house for (E)eyore to look out the window). We apply a special step (putting E in room-D) whose relevance depends on the context. Children in Group-I follow the actions in Relevant context (R): only window-D is open (E could only see from window-D); Group-II meets Irrelevant context (IR): all four windows are open (E could see from anywhere). Both Groups participate in three tests. In the 'Same Context Test' (SCT) children are playing in the model's original context. In the 'Changing Context Test' (CCT) the relevance of E's position changes for both Groups. In the 'Control Test' (CT) window-A is open therefore children are forced to achieve the goal or to follow the special step. Our preliminary data show that children reproduce more relevant steps than irrelevant ones and copy the special step more often in relevant context than in irrelevant one both in SCT and CCT. In CT they prefer achieving the goal to the means. This suggests that preschoolers imitate selectively and flexibly if they understand the goal and can exactly evaluate the relevance of actions.

A-022

Selective imitation in relation to the demonstrator's inferred knowledgeability in 18- to 24-month-old infants

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Recent research proved that children are predisposed to preferentially learn from knowledgeable people by the means of high fidelity imitation. The attribution of reliability stems from behavioral cues or some features of physical appearance, like age (Zmyj et al., in press). However, it is still an open question what kinds of characteristics guide infants to

imitate with high fidelity. We propose that infants around their second year can integrate information based on inherent features and transient communicative cues in order to benefit as learners in a situation. 68 children were randomly assigned to one of the following conditions: adult model with ostension, child model with ostension, adult model without ostension, no -model-baseline. The demonstration (in which the model chose a less affordant tool to achieve the goal) was presented on videos, followed by the imitation phase with 5 min delay. According to our preliminary results, social learning is detectable in all model conditions to some extent (as measured by the increased frequency of tool-use compared to the baseline), but is influenced by both the model's perceived reliability and its intention to teach. Selective imitation was found on the basis of reliability: while the communicative reliable model evokes high fidelity imitation, the communicative child does not. Additionally, out of a communicative context infants are less likely to imitate as a first attempt. This study reveals that both the model's inherent properties, like knowledgeability and her situational characteristics, like utilization of ostensive cues influence infants' social learning strategy.

A-023

Understanding of cooperative actions in 12-month-olds - an eye tracking study

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Within the first year of life, infants develop a sensitivity to goal-directed actions (Woodward, 1998; Falck-Ytter, Gredebäck, & von Hofsten, 2006). The ability to anticipate others' action goals is captured in goal-directed eye movements. This eye tracking study investigates the understanding of cooperative actions in 12-month-olds (N=35). Gaze behavior was recorded while infants observed a human passing-and-receiving action in which a hand grasps a ball and passes it to another hand forming either an ordinary receiving gesture or an inappropriate control hand gesture. Latencies of goal-directed gaze shifts were measured and assessed to be anticipatory if infants' gaze fixated the receiving hand before the passing hand arrived at the goal. This study is the first to demonstrate that 12-month-old infants are able to anticipate a human passing-and-receiving action ($n = 17$, $M = 73.7\text{ms}$, $SD = 216.5$), but not the control condition ($n = 18$, $M = -280.2\text{ms}$, $SD = 312.7$). Gaze latencies differed significantly between the two conditions, $t(33) = 3.87$, $p = <.001$. In a second experiment in which a robot receives the same ball while forming either an appropriate or inappropriate receiving gesture we discussed the findings of the first experiment in terms of possible underlying processes driving anticipation. It was assessed whether infants' ability to anticipate the human receiving hand is based on a matching process between the geometrical configuration of the ball and the appropriate hand

gesture or if it is elicited by an encoding process of the social gesture and the presented human interaction.

A-024

18-month-old infants' mimicry and play initiation

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What impact does mimicry have on infants' social interactions? Mimicry has a positive influence on ongoing interactions for both adults (e.g., van Baaren, et al., 2004) and young children (Eckerman & Stein, 1990; Eckerman, 1993; Grusec & Abramovitch, 1982; Lubin & Field, 1981). In two experiments with 18-month-old infants, we explored whether mimicry is also related to social behavior in subsequent interactions, which would suggest that it is used to indicate a social connection and commitment to further interaction. In Experiment 1, we found that infants who were mimicked by an adult during an initial 4-minute play phase were later more likely to invite her to play with a new toy ($z = -2.15$, $p = .03$) and they learned marginally more steps from an action sequence she demonstrated ($t(30) = 1.92$, $p = .06$). In Experiment 2, infants had the chance to spontaneously mimic the adult during the play phase. We found that infants who spent more time mimicking the adult's actions were more likely to invite her play with a new toy (Wilcoxon $W=184$, $p = .03$), but not more likely to request items from her (Spearman's $\rho = -.01$, $p = .95$) or to direct her attention to an interesting event (Spearman's $\rho = .13$, $p = .49$). Together, the results suggest that mimicry is related to future willingness to play together, both when the infant is mimicked and when the infant mimics another and thus could serve as a non-verbal form of committing to joint interaction.

A-025

The effect of labels on infants' formation of social categories

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Previous findings by Waxman and colleagues showed that labels facilitate infants' learning of animal categories. Here we tested whether labels have a similar effect on infants' formation of social categories. Thirty six 9-13 month-olds ($M = 10.7$ months) were tested in Balaban & Waxman's (1997) procedure. In a familiarization phase, a series of nine individual pictures depicting exemplars of a given category were projected on a screen. For half of the infants, a novel label accompanied the presentation of six of the familiarization trials; for the other half of the infants, no label was presented. In the test phase, infants

were shown a pair of pictures: an exemplar from the familiar category and an exemplar from a contrasting category. Infants saw either an animal category (horse/cow), or one of four social categories: gender (men/women), race (black/white), ethnicity (Jews/Arabs), or shirt-color (blue/red). We found that infants looked longer at the contrasting category exemplar in the Label condition ($M = 60\%$) than in the No-label condition ($M = 47\%$). This pattern was found for each of the social categories assessed. Moreover, only in the Label condition did infants' proportion of looking time at the contrasting category exemplar differ significantly from chance. These findings indicate that at this point in development, labels are equally effective cues for categorization in both domains - animal and social. Keywords: Social categorization, Labels, Infants

A-026

Development of the Theory of Mind from 6 to 30 years of age

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Theory of mind (ToM) is the ability to infer other people's mental states, such as beliefs, intentions and feelings. Much is known about the development of ToM in infancy and early childhood. However, the age-related changes of cognitive and affective components of ToM in adolescence and adulthood is not comprehensively characterized. The aim of our study was to examine the age-related changes of ToM performance from childhood to adulthood. We investigated 150 children from the age of 6 to 12, and 40 subjects from the age of 14-30. Faux Pas Recognition Test, Faces Test and false belief tests were administered for assessing ToM performance. Faux Pas Recognition Test (Baron-Cohen et al., 1999) assesses the ability to recognize when somebody says something awkward and it has negative emotional consequences for the listener. Working memory capacity was also measured in order to investigate the role of general cognitive functions in ToM development. We found that children, who successfully passed the false belief tasks showed better performance on faux pas detection. According to our results there is no evidence for significant age-related differences in faux pas recognition, but we found increasing performance in affective ToM by age, measured by Faces Test. There is significant relationship between working memory capacity and faux pas recognition in childhood, but it disappears in adolescence and adulthood. Our results suggest a domain-general pattern in childhood in that ToM and other cognitive functions develop together. In contrast from adolescence these domains are getting more independent.

A-027**The role of regular and irregular stress information in early language processing in Hungarian: an electrophysiological study****L. Garami¹, A. Ragó¹, F. Honbolygó² and V. Csépe²**¹University of Eötvös Loránd, Budapest, Hungary²Hungarian Academy of Sciences

During language acquisition the main task for learners is segmentation the fluent speech into meaningful elements. Prosody has a main role in segmentation from early ages. However, different prosodic cues and the use of fixed or non-fixed stress language pattern can cause different strategies that learners would apply in different languages. We examine the nature of early stress representation in a language with fixed stress. We have conducted an electrophysiological experiment (passive odd-ball paradigm measuring ERPs, 33 infants) and a behavioral control study (go/no go head turn preference paradigm, 36 infants) with the same set of stimulus: bi-syllabic Hungarian pseudo-words with regular or irregular stress pattern. We examined two age groups (10 and 6 months olds) in two conditions, varied by the position of the regularly stresses stimulus (in standard or deviant position). Our ERP results show age differences in both conditions, as only 10 month-olds showed mismatch responses to stress violation. Younger infants only detected the acoustic changes between the two stimuli. As 10 month-olds show similar mismatch responses in the two conditions, we concluded that they can use stress information to differentiate linguistic element but they don't expect a specific stress pattern even in a highly regularly stressed language as Hungarian. In the HTP study we have found differences between the two age groups in the regular condition but in the reverse one. This reaffirm our earlier inferences, namely infants start to form an early form of stress representation only from the second half of the first year.

A-028**The ability to differentiate between intention and desired goal in preverbal infants****K. Gellén and D. Buttelmann**

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Intention understanding is an elementary building block of Theory of Mind acquisition (Carpenter, Akhtar & Tomasello, 1998). Although infants' understanding of goal-directed and intentional action has been previously investigated by various paradigms (e.g. see Baldwin, Baird, Saylor & Clark, 2001; Meltzoff, 1995); when it comes to their ability to differentiate between these mental states, the literature is limited to only a handful of

studies (e.g. Schult, 2002). Since these studies have involved verbal elements, only older children were used as participants. Through the implementation of an exclusively non-verbal task the present study extends the body of research on the differentiation between intention and goal understanding to preverbal infants. Using an imitation paradigm, we investigated whether 14-month-olds interpret intentional actions solely on a goal-level or also on an action-plan-level. In addition, the role of emotional understanding in the ability to interpret others' intentional actions has been studied. After a demonstration phase of a complete intentional action infants have observed the experimenter performing only one component of what has been previously shown: either the action plan (Only means condition) or the goal element (Only goal condition). In the two rounds of the task different emotional reactions were displayed, sad and happy, before the infants were provided with the chance to decide which components of the previously observed action they wanted to imitate. Infants' imitation will be interpreted as reflecting their ability to distinguish/or their level of processing. Data collection is still in progress but will be finished within the next couple of weeks.

A-029

How do Hungarian preschoolers interpret doubly-quantified sentences?

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The aim of the research is to investigate what strategies Hungarian children use when interpreting potentially ambiguous doubly-quantified sentences, such as (1)

(1) *Három tornyot is két fiú épít.*

'Three towers (each) are being built by two boys.'

The processing and production of set operations expressed by quantifiers require high levels of cognitive capacity. The ability of processing quantifier scope (and scopal phenomena in general) also presupposes that the speaker possesses the basic competences in the domain of all major linguistic subsystems (syntax, semantics, and prosody). For this reason, the investigation of the acquisition of quantifier scope has become a major topic of the last decade's psycholinguistic literature, see Lidz & Musolino (2002, 2006), Zhou & Crain (2009).

The syntactic behaviour of quantified constituents in Hungarian is somewhat different from what has been observed in many other languages as a result of which the linear order of quantifiers preceding the verb has been claimed to determine their scopal relation.

In a previous experiment (Gerőcs 2011, conducted with 16 Hungarian children, mean age 6;4) it has been revealed that irrespective of the syntactic structure (which manifests itself

in the linear order), children prefer a reading of doubly-quantified sentences in which the subject quantifier takes scope over the non-subject one.

In the experiment I would like to present 20 Hungarian children (mean age: 5;5) were involved and the Truth Value Judgement Task (Crain & Thornton 1998) was used. It was investigated whether the asymmetry in children's preferred readings can merely be attributed to the grammatical function of the quantifiers, or other properties (thematic role, animacy) are also responsible. It is also a question to what extent children's judgements can be accounted for in terms of syntactic relations and what other cognitive factors concerning arithmetic operations and number representation play a role in this.

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A-030

Infants communicate according to the recipients' perception

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Recent studies have shown that infants' pointing gestures are accompanied by vocalizations (Franco & Butterworth, 1996; Haynes et al., 2004). Liszkowski et al. (2008) found that 12-month-olds used more vocalizations in situations in which a recipient did not share attention to the infants' communicative act as compared to situations in which she did share interest. In the present study, we wanted to find out more about 12-month-olds' gestural and vocal behavior in situations, in which the recipient not only is not interested in the communicative act, but, because of a visual barrier, is not able to see a gesture. Therefore, we systematically investigated the vocal and gestural behavior in two different conditions, in which a recipient could or could not see the pointing gesture. We hypothesized that infants understand that pointing is not sufficient in the latter condition and thus use more vocalizations and less pointing. We found that across conditions, infants used vocalizations more often than pointing gestures ($F(1,15)=11.616$; $p<0.001$). In situations in which the recipient could not see the point and thus, the gesture was not

successful, infants used significantly more often vocalizations with a speech-like syllable structure as compared to situations, in which the pointing gesture on its own was sufficient ($p < 0.001$). The present results suggest that 12-month-olds' gestural and vocal behavior is used intentionally because they differ according to the perception of a recipient. Infants seem to understand that pointing sometimes is not sufficient. In these cases, they concentrate on other, more efficient communicative ways.

A-031

Sequence processing in developmental dyslexia

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The question whether the causes of dyslexia are specific to language or found across modalities has fostered a long debate. Recently, Szmalec, Loncke, Page & Duyck (in press) showed that dyslexic adults are impaired in Hebb sequence learning, be it with verbal or visuospatial material. Here we investigated whether the impairment in sequence learning is due to an underlying problem to reliably encode ordered information in working memory.

Administering a task that emphasizes item versus order processing, we investigated sequence processing during verbal and non-verbal working memory tasks in 14 good and 14 poor readers of 2nd and 4th grade of elementary school. The design comprises a 2 (verbal/nonverbal) x 2 (item/order) recognition task including two order tasks, one with letters and one with nonsense figures, and two item tasks, one with nameable pictures and words, and one with a different set of nonsense figures.

Results show a main effect for order and group that did not depend on whether the material was of verbal content. Overall, dyslexics performed less accurate on both order tasks (verbal order: $F(2/26)=10.29$, $p=.0035$, nonverbal order: $F(2/26)=4.131$, $p=.05243$), but not on item tasks ($F(2/26)=0.8523$, $p=.4385$), with a more pronounced difference for verbal order (mean accuracy in poor readers = 0.724, mean in good readers = 0.816, nonverbal order: mean in poor readers = 0.656, mean in good readers = 0.719).

These findings support an integrative explanation for phonological as well as magnocellular functioning impairments and position this study within sequence learning and working memory problems reported in the literature.

A-032**Preschoolers' advantage for representation of internally-driven object transformation. Object unity or internal causation?****M. Haman**

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Previous experiments (Haman, 2010, Hernik, Haman, BCCCD2010) assessed young children's representation of internally-driven (biological-like) transformations involving co-occurrence of features in succession. Participants were familiarized with animations in which a unicolored shape ("the seed") was gradually covered with gray bubbles "growing" from its inside until the seed's surface was no longer seen, at which point final colored bubble emerged. The same sequence of initial and final state was presented in the external-change group, but the bubbles were flying-in from off the screen. Test movies showed similar sequences, with the final bubble matching in color or not. Shorter looking times (infants) or quicker decisions, which of the tests match familiarization (preschoolers), suggested an advantage in processing sequences of features in internally-driven transformations. However, two issues remains: external-change may be more complex (more spatially-separated objects), and this may be object unity rather than internal causality that promoted accessibility of the sequence representation in internal change. Current study (in progress) deals with both these issues. New materials are used within the same experimental design. In both (internal and external change) conditions bubbles grow from the object's inside. However, in the external-change condition the "seed" is being touched by an external rod before each bubble emerges, while in the internal-change condition the rods move without contact nor coordination with the "seed". Now in both conditions object unity is preserved and perceptual complexity is equal. Four-to-six year old participants are involved.

A-033**3-year-olds share based on merit considerations after collaboration****K. Hamann, J. Bender and M. Tomasello**

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A fundamental aspect of justice is fairness in distribution. Resource distribution according to principles like parity and merit is rooted in a complex developmental pattern, beginning with visual preferences for equal allocations at 16 months of age (Geraci & Surian, 2011). In situations imposing a cost on the distributor, children do not show egalitarian tendencies until age 5 (Rochat et al., 2009; Fehr et al., 2008), the only exception being collaborations

eliciting equal sharing among 3-year-olds (Warneken et al., 2010; Hamann et al., 2011). Young preschoolers' meritocratic allocation of rewards within collaborative setups has not been investigated. Therefore, we presented 32 pairs of 3.5-year-old peers with a collaborative task to obtain rewards by pulling ropes. In order to establish differences in work input, one child's rope was not immediately accessible but had to be retrieved from the apparatus by means of a hook-like tool, while the other child had no such additional work to do. The final state of the apparatus was that one individual had 1 toy and the other had 3. In the Deserving condition, the working child received more than her peer. In the Undeserving condition, the working child received less than her peer. On average, children with 3 toys shared more in the Undeserving condition ($M=.91$ rewards) than in the Deserving condition ($M=.48$; $t(30)=2.29$, $p<.05$). The present finding adds new evidence to the claim that peer collaboration provides a specifically encouraging framework for children's developing understanding of norms of fairness and equity (Piaget, 1932; Tomasello, 2009).

A-034

Mind your head? Infants' observation of a social scene

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Introduction. Our current knowledge of infants' understanding of others' social interactions is limited. Recent studies have used naturalistic conversations that contain a wide spectrum of social cues, such as motion, speech and contingency (e.g. Augusti, Melinder, & Gredebäck, 2010). Using a more bottom-up driven approach to disentangling the effects of single cues, we used static visual information to investigate how head direction and eye status affect infants' observation of a social scene.

Method. We used the Tobii T120 eye tracker to present 9- (N=15), 16- (N=15) and 24-month-old (N=14) infants with static images of individuals. Their head direction (face-to-face vs. back-to-back) and eye status (open vs. closed) differed between conditions. The dependent variable was the number of gaze shifts made between the two individuals.

Results. 16- but not 9- and 24-month-old infants gaze shifts differed significantly with respect to head direction ($F(1,14) = 4.87$, $p<.05$, $\eta^2= .26$). At 16 months, infants shifted their gaze more often in the face-to-face ($M= 1.75$, $SE= 0.16$) relative to the back-to-back ($M= 1.5$, $SE= 0.13$) condition. No significant effect of eye status was found.

Discussion. Our findings demonstrate that at 16 months, the head direction of the observed individuals affects infants' observation. However, head direction embedded in a context of static visual information may not be sufficient to convey relevant meaning to older infants and be harder to differentiate for younger infants.

A-035**Do low-functioning children with autism rely on perceptual resemblance when decoding abstract picture-referent relations?****C. Hartley and M. L. Allen**

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When faced with an abstract pictorial representation, neurotypical children use intentional information to identify its referent. By contrast, low-functioning children with autism (CWA) may be unable to decode picture-referent relations via this strategy due to their failure to understand intentionality. Here we investigate whether picture processing in CWA conforms to the theory of 'naïve realism' which posits that picture-referent relations are decoded exclusively through perceptual analysis. Participants were presented with pairs of differently-sized 'abstract' pictures (e.g. small and large circles), and were asked to identify the picture that depicted either a small or a large referent (e.g. elephant or mouse). Participants were then asked to select the actual 3-dimensional referent of the picture from an array consisting of the intended referent (e.g. a model elephant), an object that resembled the abstract picture (e.g. a ball) and a distracter. CWA used relative size to infer correct picture-referent relations in 75% of trials, a rate significantly greater than chance. However, when asked to identify an abstract picture's 3-D referent, CWA selected the object that resembled the picture in nearly 61% of trials and the intended referent in just 30% of trials. Conversely, neurotypical children selected the intended referent in 79% of trials. These findings indicate that low-functioning CWA can discriminate abstract pictures based on intentional information. However, they perceive such pictures to be representations of whatever objects they look most like, supporting the claim that CWA are naïve realists.

A-036**Does iconicity influence referential understanding of pictures in low-functioning children with autism?****C. Hartley and M. L. Allen**

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Pictures can represent a unique exemplar (e.g. my red chair) or an object category (e.g. all chairs). Accordingly, words (e.g. "chair") can be extended to all objects that share the same category-defining shape (e.g. blue chairs) in addition to the specific referent of a picture. However, low-functioning children with autism (CWA) typically map labels onto the concrete surfaces of pictures rather than their referents. Building on Preissler (2008), we investigated whether iconicity (perceptual similarity between picture and referent) influenced the symbolic understanding of pictures by CWA matched with neurotypical

children on receptive language ($M = 3.9$ -years). We also examined whether iconicity affected generalisation of labels from pictures to novel category members. Participants were taught a novel word (e.g. “Zepper”) repeatedly paired with a picture of an unfamiliar object. They were asked to identify the referent of the newly-learned word from arrays consisting of the target picture paired with the depicted object or a novel category member. Trials varied in iconicity (black-and-white line drawing, colour line drawing, greyscale photograph, colour photograph). CWA demonstrated high rates of associative learning (selecting the picture) across conditions. However, they were significantly more likely to extend a label to a real object depicted in a colour picture. Regardless of iconicity, CWA were unwilling to generalise a label from a picture to a novel category member, unlike neurotypical children. Although CWA are more likely to perceive colour pictures as referential, CWA may believe such pictures represent one unique exemplar rather than an object category.

A-037

Expectations about Co-retaliation in Toddlers

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Recent research suggests that, if an individual acts negatively toward another individual, children expect the second individual to react negatively in retaliation. Here, we examined how individuals' group membership modulates toddlers' expectations about retaliation. Events involved members of two arbitrary social groups, A and B. Toddlers first saw A1 act negatively toward B1. We asked whether toddlers would expect B2, but not A2, to react negatively toward A1. 29-month-olds were assigned to an outgroup or an ingroup condition, and group membership was marked by novel naming labels (“I’m a jaybo!”, “I’m a topid!”). Toddlers were presented with two familiarization trials and one test trial. Their looking time patterns show that by 2.5 years, toddlers already attend to group membership and expect individuals (1) to co-retaliate against outgroup individuals who have acted negatively toward ingroup members, but (2) to help ingroup members in need of assistance irrespective of whether they have acted negatively toward outgroup individuals. The results from these and control conditions suggest that toddlers' expectations of co-retaliation are not simply due to the general discrimination against outgroup members, nor due to a general negative attitude toward anyone who has previously acted negatively. Based merely on some transient features of the individuals, toddlers can already form social groups and have different expectations for ingroup and outgroup individuals. Moreover, toddlers have some rudimentary understanding that ingroup loyalty entails co-retaliation against outgroup individuals who have acted negatively toward ingroup members.

A-038**The influence of action perception on action production in 9-month-old infants****I. Henrichs and B. Elsner**

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Recent research indicates a link between infants' perception and production of human actions (Hauf, 2009). However, it is still unclear whether infants' perception of novel inanimate actions would influence their subsequent action production. The purpose of the current study was to test whether 9-month-olds would selectively reproduce the goal-relevant aspects of observed actions of an inanimate object. Infants were habituated to a self-propelled ball rolling towards one of two targets and causing a salient action-effect on it. In a control condition, the ball was moved by an external source of energy and there were no action-effects. In a subsequent test phase, infants acted on colored styrofoam models of the two target objects placed in front of them. The first reaction (grasping or pointing) within 30 seconds was coded. In the self-propelled condition, a significantly higher number of infants ($n = 17$) grasped or pointed towards the habituated target object than chose the new target object ($n = 7$), $X_c(1) = 4.17$, $p = .04$. By contrast, in the control condition, about the same number of infants reacted towards the habituated target object ($n = 14$) or to the new target object ($n = 11$), $X_c(1) = 0.36$, $p = .55$. Our results indicate that 9-month-old infants' action perception can influence their subsequent action production when the observed actions of an inanimate agent display animacy cues such as self-propelled movement and salient action-effects.

A-039**Infants fast-map fronts of novel agents and use them for action anticipation****M. Hernik^{1,2} and P. Fearon²**¹Cognitive Development Center, Central European University, Hungary²University College London, UK

Most animals have bilateral body-plans. They have fronts and backs and move forwards more often than backwards. As a consequence, an animal's orientation in motion is a reliable source of information about its frontal features (the parts at the front of a moving animal likely are its frontal features). But also, the location of the already-known frontal features of an animal in rest is a reliable source of information about that animal's ability to act (it is more likely to start moving in the direction determined by its frontal features). The

present series of studies was designed to test whether preverbal human infants can readily draw inferences like these when confronted with novel agents. Six- and 12-month-olds first observed a novel 3D-animated agent (a box) chasing a target (a ball). When, after just two familiarization trials, the agent ceased to resume the chase upon the ball's entry, infants showed longer anticipatory waiting if the now motionless agent was oriented towards rather than away from the ball, even if the agent's frontal features were novel, but only if during familiarization the agent had exerted sufficient behavioral cues, like self-steering and contingent distant reactivity. Thus, preverbal human infants spontaneously use a novel agent's direction of motion to fast-map its unfamiliar non-human like frontal features, and subsequently take their orientation into account when anticipating the agent's actions. These results support the notion of a basic cognitive adaptation for processing actions of animals constrained by bilateral body plan.

A-040

Other-awareness in autism: Evidence from a collaborative computer task

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Children with Autism Spectrum Conditions (ASC) are said to lack awareness of self and of others. Such awareness is a necessary prerequisite for joint action and, according to Moll & Tomasello's (2007) Vygotskian Intelligence hypothesis, joint action is a driving force of individual cognitive development. This poster describes 2 studies of children collaborating on a shared sorting task using software designed to support awareness of other through separate control of a dual interface. In Study 1, 32 typically-developing preschoolers completed the task in pairs with a peer or an adult partner. Videotapes were analysed for rates of awareness. Active other-awareness occurs when one child acts contingently on the action of their partner. Passive other-awareness is awareness without contingent action. Analysis of their videotaped interaction showed similar rates of other-awareness regardless of interface. We argue that this is because TD preschoolers can work cooperatively without extra support. In Study 2, 4 children with ASC and severe learning difficulties worked in adult and peer pairs on the sorting task. These children showed no active other-awareness in the unsupported condition, but clear active other-awareness in the supported condition, behaviour they reportedly did not normally exhibit. Both ASC and TD groups were more socially interactive when partnered by a peer than an adult. The results suggest that children with ASC may possess latent abilities to coordinate social interaction that become evident with appropriate support. We discuss this in relation to theories of other-awareness in autism.

A-041**Seeing the base problem hinders 5-year-olds' ability to solve an analogy task: the role of executive functions****A. Hribar and J. Call**

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Analogical reasoning is an ability to flexibly extend knowledge from a known (base) problem to a novel (target) one by mapping relations. In the present study we investigated the effect of the presence of the base problem on 5-year-old children's (N=32) analogical mapping ability in two mapping tasks. Both tasks consisted of searching for a picture hidden in one of the two cubes of same color but of different sizes. During the training phase, children in the Seeing task saw where the experimenter placed the picture and could retrieve it after a short delay whereas in the Learning task, children did not see where the picture was placed but learned that it was always in the same cube (e.g., the large one). In the transfer phase, children searched for the picture in a novel pair of different sized cubes, while the training pair was either absent (Sequential test) or present (Simultaneous test) at the time of choice. Children performed equally well (and above chance) in both transfer tests in the Learning task whereas children in the Seeing task performed significantly better in the Sequential test where the training pair was removed from the platform than in the Simultaneous test. We propose that this outcome is due to children needing to inhibit their responses toward the training pair in the Simultaneous test where it stayed on the platform which posed additional demands on their executive resources. Thus, the greater the requirements on executive functions, the lower their mapping performance became.

A-042**Same but Different? Pretense and False Belief Reasoning and their Underlying Neural Correlates in Children and Adults****N. Kuehn-Popp, J. Meinhardt and B. Sodian**

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Why do children understand pretense earlier than false belief scenarios even though both forms of behavior require a distinction between reality and a false representation of reality? This question has been topic of vivid discussion in developmental psychology. An open question concerns of whether both abilities are subserved by the same cognitive mechanism or not. Furthermore, it is unclear whether there are age-related differences in

the underlying representational understanding (e.g. Leslie, 1987; Perner, 1991). To address these issues, we investigated the neural underpinnings of pretense and false belief reasoning by means of an event related potential (ERP) study in children and adults. To this end, 6-8-year-old children (n=21) and adults (n=24) were presented with cartoon stories that depicted pretense, false belief, and reality scenarios, with reality serving as control baseline. In accordance with previous ERP studies, false belief reasoning was associated with a late positive anterior and late negative posterior slow wave in children and adults (e.g. Meinhardt et al., 2011). In contrast, pretense was related to early negative frontal and early positive posterior slow wave processes in both age groups. Additionally, there were developmental effects. Children showed lateral differences, longer latencies, and broader frontal distribution than adults. This indicates that even though both pretense and false belief reasoning are associated with frontal slow wave patterns suggesting decoupling processes in children and adults, they seem to rely on different neurocognitive mechanisms. We propose a 'middle ground theory' with pretense requiring mental but not metarepresentational abilities in children and adults.

A-043

Are True Beliefs still Beliefs? Neurocognitive Basis of True and False Belief Reasoning in Adults and Children

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A functional imaging study aimed to specify the neurocognitive underpinning of Theory of Mind reasoning, in particular of the attribution of false and true beliefs, in adults and children. The right temporo-parietal junction (RTPJ) is assumed to play a crucial role in false belief attribution. However there is a controversy in recent literature whether this region is also associated to the attribution of true beliefs as belief attribution may be optional here (see Saxe, 2010). Activity in the medial prefrontal cortex (MPFC) might be related to an inhibitory process, necessary to juggle diverging perspectives occurring in the false belief task. A modified "Sally-Anne scenario" asked adults (N=18; MA=25 years; SD=2.2) and children (N=11; MA=9;5 years; SD=0;6) to attribute false and true beliefs. A control condition required reasoning about the physical reality. In adults MPFC activity was related to processing of perspective differences rather than selective to false belief reasoning. This finding corroborates the notion of an inhibitory process subserving false belief attribution. A region of RTPJ was associated to the attribution of false as well as true beliefs compared to reasoning about physical reality. It is assumed that participants did engage in belief attribution also in the true belief condition. Compared to adults children showed extensively increased right lateralized activity related to false belief attribution what implicates a modulation of the neural basis of false belief reasoning during development.

POSTER SESSION B

B-001

What is The Best Time to Acquire New Skills: Age-related Differences in Implicit Sequence Learning across Life Span

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Implicit skill learning underlies not only motor, but also cognitive and social skills. Nevertheless, the ontogenetic changes in humans' implicit learning abilities have not yet been comprehensively characterized. We investigated such learning across the life span, between 4-85 years of age with an implicit probabilistic sequence learning task, and we found that the difference in implicitly learning strongly vs. weakly predictable events exhibited a characteristic and rapid decrement around age of 12. These lifelong learning efficiency measurements support an extension of the traditional 2-stage lifespan skill acquisition model: in addition to a decline above the age 60 reported in previous studies, sensitivity to raw probabilities and, therefore, acquiring fundamentally new skills is significantly more effective until early adolescence than later in life. These results suggest that due to developmental changes in early adolescence, implicit skill learning processes undergo a marked shift in weighting raw probabilities vs. more complex interpretations of events, which, with appropriate timing, prove to be an optimal strategy for human skill learning.

B-002

Red to green or fast to slow: Infants' use of equally salient static (color) versus dynamic (rotation speed) features in object identification

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Infants' use of dynamic versus static properties has been contrasted in category formation (Rakison & Poulin-Dubois, 2002), object completion (Kellman & Spelke, 1983) and object individuation (Wilcox & Schweinle, 2003). The "...tendency to attend to moving things over static ones" (e.g. Rakison, 2004) feeds a conventional wisdom that dynamic features - in search, memory, identification - trump static ones. But comparisons like this are only fair if manipulations to these feature dimensions are equally salient (Kaldy & Blaser, 2009). Here we compared 6-month-old infants' visual working memory (VWM) for a static feature (color)

and a dynamic feature (rotation speed). Our revised, more general Interdimensional Saliency Mapping (ISM) method was used to calibrate stimuli beforehand. A Tobii T120 eye tracker measured eye movements. Methods: **1) ISM:** 16 full-term 6-month-old infants participated. The 'baseline' stimulus was a green, slowly (22.5 deg/s) rotating star. ISM was used to find a speed difference that was equally salient (79% preferred to baseline) to a particular color difference (yielding 22.5 vs. 82 deg/s and green vs. red, respectively). **2) VWM test:** 28 6-month-olds participated. Results showed that infants noted a red to green (or vice versa) change made to a briefly occluded object, but not an equally salient fast-slow (or vice versa) change. This is consistent with our Ecological Principles hypothesis: features more diagnostic of object identity are better remembered. Taken together, this shows it is possible to fairly compare static and dynamic features, and that the static may trump the dynamic.

B-003

Delayed imitation with change of contextual relevance reveals inflexible memory processes in early childhood

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Results on selective imitation in young children imply at least two competing interpretations. On the one hand it can be that children encode only the goal-relevant components of events. However, it is possible that children encode specifics of the original situation, but they do not use them during re-enactment - in this case the selection processes happen during retrieval. With delayed imitation we can rephrase the question, whether memories of young children are flexible enough to adapt during retrieval processes to the characteristics of the situation. We presented 24-month-old children (n=42) with a four-step event with two 'irrelevant' components open to imitation, and varied whether one of the steps (a tool use) was relevant during encoding and irrelevant in retrieval phase or vice versa. The other step was irrelevant in both cases. In half of the children we emphasized the situational constraint (the basis for the relevance of the tool use). Every child participated two times, the first time including a presentation and the second time after a week delay without presentation. According to our results, children tend to selectively imitate the necessary components in immediate re-enactment, but only in the presence of explicit evidence on the efficacy of tool use. However, after the delay, in the changed context children follow their original strategy irrespectively of the contextual cues in the retrieval phase. On the other hand, from re-enactment they leave out the fully irrelevant component more frequently in the condition, where the tool use was relevant during demonstration.

B-004**Sympathetic stance in preverbal infants****Y. Kanakogi¹, Y. Okumura¹, Y. Inoue², M. Kitazaki² and S. Itakura¹**¹Department of Psychology, Graduate School of Letters, Kyoto University, Japan²Department of Computer Science and Engineering, Toyohashi University of Technology, Japan

Do preverbal infants show sympathy for a victim? A number of developmental studies have demonstrated that toddlers and young children show concern for others in distress. However, no empirical studies have investigated the ontogenetic roots of sympathy in early infancy. We investigated whether preverbal 10-month-old infants were predisposed to prefer a victim over an aggressor based on previously witnessed interaction between the two. Infants robustly preferred the victim over the aggressor in Aggressive interaction condition in which they watched animated sequences involving two geometric figures interacted by one figure hitting and crashing into the other figure, but not in No interaction condition in which they watched animated sequences involving two moving geometric figures without any contact (Experiment 1). Moreover, comparing infants' responses to a neutral object with those to the victim or aggressor, infants robustly chose the victim when the pair of neutral object and victim was presented. In contrast, infants robustly chose the neutral object when the pair of neutral object and aggressor was presented (Experiment 2). Taken together, these findings indicate that preverbal 10-month-old infants evaluate third-party social interactions and are predisposed to show a preference for victims, but not for aggressors. Thus, our findings suggest that sympathetic predisposition with other-orientation is present and dominant in early stages of life. We may be naturally endowed with a "sympathetic stance".

B-005**Caregiver contribution towards early conceptual development:
Acquisition of adjectives****V.V. Kazakovskaya¹ and I. Balciuniene²**¹Russian Academy of Sciences, Institute for Linguistic Studies, St. Petersburg, Russia²Centre of International and Multilingual Communication, Vytautas Magnus University, Kaunas, Lithuania

Adjectives are among the most complex and non-conceptual salient linguistic categories to acquire. This paper analyzes caregiver contribution used to stimulate this process. We hypothesize that adult support towards adjective acquisition is necessary, and linguistic input should be rich and well-structured. Based on the longitudinal corpus data of a

Russian boy and a Lithuanian girl, both subjects are typically-developing monolingual children, similar in age (1;8-2;8), social characteristics and linguistic age (MLU). The pragmatic, structural, semantic, and positional features of caregiver utterances relative to the children's adjective production were analyzed. We saw that all parental support mostly occurs at the stages of reaction (Rus. 86%, Lith. 77%), i.e. structural modifications (expansions, reformulations, repetitions etc.) of the child's previous utterance, while initiations try to elicit the adjective by special questioning or requesting a particular word. Caregiver utterances can contain a target adjective (Lith. 83%) or stimulate autonomous production (Rus. 63%). Interrogatives (Rus. 55%) and statements (Lith. 55%) are the most frequent utterances. Pragmatic distribution revealed dominance of conversational reactions to the meaning of child's adjective, whereas meta-reactions focused on incorrect grammar. Preferred types of reaction are expansions (Rus. 29%, Lith. 31%) and repetitions (Rus. 27%, Lith. 25%). Due to great variations in observed input, it can be described as being rich and well-structured. Despite differences between caregivers, main features of contribution seem similar. This evidence shows discussion of the universal aspects of conversational strategies related to early acquisition of the most complex linguistic categories is needed.

B-006

Normative sources of over-imitation

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Over-imitation still presents a puzzle in need of explanation. Two influential explanatory approaches are automatic causal encoding (Lyons et al., 2007) and normativity accounts (Kenward et al., 2011). The former claim that children over-imitate because they mistakenly take the irrelevant act to be causally relevant (Lyons et al., 2011), whereas the latter claims that children well understand the causal irrelevance of the act, but view it as part of a conventional rule-governed activity (Kenward et al., 2011). To test these accounts, measures indicative of understanding the normative status of the act in question are required, in particular third-party critique in response to omissions of the act in question. The present study investigated over-imitation and such third-party protest in 3- and 5-year-olds. In two conditions the same action sequence was introduced either as purely instrumental, focused on the goal (goal condition), or as comprising causally unnecessary means and goal (method condition). If children view the unnecessary means as a normatively binding part of a conventional activity, they should both over-imitate and protest against the third-party, and such normative understanding should be engendered more in the method than in the goal condition. Results revealed that over-imitation was very frequent overall (77% of trials) with no differences between conditions, and was frequently accompanied by third-party protest against omissions (59% of trials), with such

protest occurring less in the goal condition than in the method condition ($t(22)=-1.76$, $p < .05$, 1-tailed) for 3-year-olds. Taken together these results clearly speak in favor of normativity accounts.

B-007

The young children's sensitivity to the communicative context as a trigger for grasping new words from the adult speech

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In this research we have tested if the young children's sensitivity to the communicative context influence on acquiring new word meanings. We suppose infants and young children to be able to create the common meanings with an adult. This base is built on the joint actions with adults and mediates children attention to the new words by an adult. The way this mediation works supposes that attention is attracted to the new information that appears only in communicative context-preserving condition. If the new information appears with a change in communicative context, attention to it will be weakened for its relevance to context other than initial. We varied the communicative context in our experiments. Three- and four- year-old children heard a new word applied to the unknown artificial object while playing a game, but in one condition the communicative context were changed (the new word were uttered in the presence of a new adult who didn't participating in the game from the beginning) and in the other condition the context was preserved (second adult were there from the beginning). We found that three- year-old children recalled new object name much better in the context-preserving condition than in context-changing condition, but four- year-old children recalled equally well in both conditions. In the second experiment we found that such sensitivity to the communicative context doesn't depend on the task difficulty: four- year-old children recalled new object name again equally well in both conditions even when the task performance was significantly complicated.

B-008

Putting balls into buckets: A study on action planning in toddlers

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In this study, we examined how toddlers plan a combined reaching and walking action. Thirty- and 37-month-old toddlers and an adult control group were tested. We adapted an experimental setup previously used to investigate adults' planning of walking and reaching actions (Rosenbaum, 2008). Children had to pick up a ball at a first table and walk from there to a second table to drop it into a bucket. The ball could lie on three different positions of the first table (left, right, middle), and also the goal bucket varied in its horizontal position (five different positions). It was determined for all fifteen ball-bucket combinations which side participants walked along when picking up the ball. Results show that adults took into account both, the walking and reaching distance when choosing their walking path, with a stronger influence of the reaching distance. Toddlers tended to walk at the side of the table where they had to pick up the ball. There were no differences in walking path for the different bucket positions. One interpretation of this finding is that toddlers' walking path choice is determined to about the same extent by reaching and walking costs. Another possible interpretation is that toddlers' walking path was influenced mainly by the first sub-goal (picking up the ball). Only after walking along the side of the table where they picked up the ball, toddlers might have determined where to walk from there, which would suggest no overall planning of the two-step reaching and grasping action.

B-009**What leads the child to reorient in a navigable space?****B. Lábadi and R. Vágvölgyi**

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Reorientation of young children has been described as dependent on the geometry of the enclosed space that is incapable of combining with feature information. Paradoxically, however, most of the previous studies used formal geometric space (e.g. rectangle) which provided geometric information only about distance. In the present experiment we used kite-shape space that allowed us to investigate the children use not only distance but angles of the geometric surface of an enclosed space. The results showed that 4-year-old children could reorient based on only the distinctive angles of the room shape, but they were not able to discriminate the concurrent corners based on the left/right sense. Furthermore, children were able to combine the wall color as a feature with geometry of room. These findings provide evidence that children at age of 4 years appear to relate the shape of the surface layout with respect to either angles and distance, and the integration of geometry and feature occurs.

B-010**Rare or unknown? Finding a marker for novelty vs. familiarity in non-speaking children ERP****S. Linnert, M. Nagy, B. Tóth, E. Halász, T. Tompa and I. Király**

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In the field of infant recognition memory studies electrophysiology complements the widely used behavioral methods. This also makes such studies possible in prelinguistic age. A good candidate for a useful electrophysiological marker, and so one of the most studied ERP component is the so called “central negativity” (Nc). The Nc wave shows up on the frontal and central electrodes 400-800 ms after stimulus onset. This component is thought to be related to attentional and memory processes. These processes are difficult to distinguish at this early age, and it is an open question in the literature whether the Nc wave reflects an attentional orientation response or it is the sign of novelty detection. To address this question we designed a novel method to investigate how stimulus probability and novelty modulates the ERP and the Nc component in 10-12 month infants. Our study consists of a familiarization phase, during which infants are presented with pictures of toys with variable probabilities: half of them show up with a 75% probability (frequent familiar) and the other half with 25% (rare familiar). The recognition phase follows in a few minutes. Frequent familiar, rare familiar and new stimuli are shown with equal probabilities (33% each). EEG (128 channel, EGI) is recorded during the recognition phase. Our study design combines a conventional oddball paradigm with a familiarization phase where occurrence probabilities are modulated. This design offers to find a marker which may be suitable and stable for further studies of memory systems at a prelinguistic age. (TÁMOP-4.2.1.B-09/1/KMR-2010-0003)

B-011**Does culture influence prelinguistic cognition?****U. Liszkowski and R. Silva Zunino**

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Does culture influence prelinguistic cognition? In the classic A-not-B task, infants younger than 12 months who have consecutively retrieved an object in location A will continue to attempt to retrieve the object in location A even when they have seen it being placed in location B. While its classic interpretation in terms of object permanence has been challenged by looking time tasks, alternative interpretations invoke (i) deficient executive functions due to the immaturity of the frontal lobes, or, more recently, (ii) a cognitive bias to

attend to ostensive-referential information conveyed by the social agent who hides the object under location A. Common to all interpretations is the assumption that the task measures an early processing default of preverbal human cognition that applies universally before culture may have had an influence. The current study investigated 10-month-olds' (range 8-11 months) performance on the A-not-B task across different socio-cultural settings. 10-month-old Yucatec Mayans (N=9) and rural Peruvians (N=18), who were exposed to less prelinguistic gestural interactions, made significantly less search errors on the A-not-B task compared to Dutch infants (matched to the Peruvian sample in age & gender), who were exposed to more prelinguistic gestural interactions. Within a cultural group differences in the amount of exposure to gestural interactions yielded a negative correlation with the amount of search errors. Findings support the interpretation that receptivity to ostensive-referential communication mediates infants' performance on the A-not-B task. At the same time they challenge the idea that prelinguistic cognition is precultural.

B-012

Statistical learning of hierarchical visual structures by human infants

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Human infants are known to implicitly learn statistical regularities of their sensory environment in various perceptual domains. Visual statistical learning studies with adults have illustrated that this learning is highly sophisticated and well approximated by optimal probabilistic chunking of the unfamiliar hierarchical input into statistically stable segments that can be interpreted as meaningful perceptual units. However, the emergence and use of such perceptual chunks at an early age and their relation to stimulus complexity have not been investigated. In three experiments, we found that 9-month-old infants can extract and encode statistical relationships within complex, hierarchically structured visual scenes, but they are not able to identify and handle these chunks as individual structures in the same manner as adults. These results suggest that as stimulus complexity increases, infants' ability to extract chunks becomes limited, even though they are perfectly able to encode the structure of the scene. Apparently, the ability to use embedded features in more general and complex contexts emerges developmentally after encoding itself is operational.

B-013

Human infants represent social dominance as a relation

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Do humans spontaneously think of social dominance as an individual property, or as a social relation? To answer this question we tested human infants, determining whether they always expect dominance relationship to be transitive. If infants treat dominance as an individual property ranked on an ordered scale, then they should see dominance relationships as necessarily transitive. Alternatively if infants treat dominance as a social relationship they may not always expect dominance relations to be transitive. Infants were tested with a violation-of-expectation paradigm, and dominance defined as the capacity to prevail when two agents have conflicting goals. In the familiarisation, participants saw two dominance relationships: agent A was subordinate to B, and B was subordinate to C. During test, infants showed a violation-of-expectation when the dominance relation between two agents from a familiar pair (A and B, or B and C) was reversed ($t(15) = 2.69$, $p = .017$). Conversely, when A faced C, infants' violation-of-expectation was significantly lower, and did not reach significance level ($t(15) = 0.441$, $p = .665$). Thus infants appeared to remember that A was subordinate to B, and that B was subordinate to C, but they did not infer that A was subordinate to C, suggesting that they did not expect the dominance relations to be necessarily transitive. These results suggest that from an early age, humans spontaneously represent dominance as an asymmetric relation, and not as an individual property organised on an ordered scale.

B-014**Neural underpinnings of feedback monitoring in toddlers****M. Meyer, D. Janssen, E. de Bruijn, S. Hunnius, H. Bekkering**

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In everyday actions, young children strongly rely on feedback to learn and adjust their behaviour. In adults, many electrophysiological studies have elucidated feedback monitoring processes as reflected in a neural marker called the FRN (feedback-related negativity). Moreover, a direct relation between the FRN and frontal brain areas (e.g. ACC) has been shown. Interestingly, in brain development frontal brain regions are the latest to mature. The question arises whether already young children show neurocognitive processes of feedback monitoring similar to those of adults and in how far children's feedback-related brain activity is linked to their adaptive behaviour. We were interested in two aspects of feedback: 1) valence (positive vs. negative feedback) and 2) informative value (predictable vs. unpredictable feedback). In an EEG experiment, we assessed the brain activity and performance of 30- to 36-month-old children while they were playing a simple card game on a touch screen interface. Children were given visual and delayed auditory feedback on their actions. The same set-up was used to test an adult control

group. EEG and behavioural measures were analyzed with respect to the valence and informative value of the feedback. Results of the adult control group and preliminary data of the children indicate both, differential brain activity for positive and negative feedback and the feedback predictability. Consequences for feedback-based learning are discussed.

B-015

Children's understanding of replica, iconic gesture and pretence: a high-level of similarity and the hand-as-a-signifier are beneficial for symbol understanding

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Existing research highlights various properties of symbols that make young children's understanding of symbols easier. However, there is no agreement on which type of symbol understanding develops first. This study investigated 3-to-5-year-olds' understanding of three types of symbol. Each type had a property that has been claimed to facilitate children's symbol understanding: Replica (high similarity between signifier and referent), Gesture (using hands as a signifier), and Transformed Object Pretence (creating a 'pretence world' to separate the non-symbolic identity, e.g. a cup, and symbolic identity, e.g. pretending the cup is a hat). Children were presented with one of the three types of symbol and selected the referent for the symbol from a set of four objects. Children chose the correct referent above chance for Replicas earlier (26 months) than for Gestures and Transformed Objects (after 36 months, no significant difference between Gestures and Transformed Objects). This indicates that high signifier-referent similarity is a more dominant factor in facilitating children's symbol understanding than the hand-as-a-signifier and pretence world. However, there was evidence that the hand-as-a-signifier helped children separate the symbolic and non-symbolic identities of the signifier. Children sometimes reached towards Replica and Transformed Object signifiers, but never towards Gestures. This indicates that children sometimes did not see Replicas and Transformed Objects as signifiers, but as objects in their own right (to be grasped). Gestures are easier to identify as symbolic, but their interpretation is not as easy as Replica due to a lack of signifier-referent similarity.

B-016

American and Chinese Preschoolers' Procedural Skill and Conceptual Knowledge in Mathematics

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Many studies have documented the difference in math achievement between children in the United States and China. However, fewer studies looked at preschoolers who have not received formal math training; or provided data of Chinese children from less affluent rural background; or differentiated procedural skills and conceptual knowledge in math achievement. The current study aims to extend the prior research and investigate the procedural skills and conceptual knowledge of American and Chinese preschoolers. Study participants included 439 three-, four- and five-year-old children: 107 from the U.S., 188 from Chinese urban areas, and 144 from Chinese rural areas. Each child completed five math tasks. Two tasks tested procedural skills, including verbal counting and computation. Three tasks tested conceptual knowledge, including number line estimation, number conservation, and the child's understanding of counting principle. Results showed that Chinese children from both urban and rural areas had a significant advantage over American children in procedural skills. Regarding conceptual knowledge, Chinese children from urban areas exhibited the following: a strong advantage over American children in the development of linear numerical representation and understanding "how-to-count" principles, and a strong disadvantage in their understanding of the "what-to-count" principles and number conservation with 3 objects. Chinese children from rural areas differed less from American children. The data also showed that the cross-cultural difference in math achievement emerge at age 4.

B-017

Adaptive maternal synchrony: multimodal practices are tailored to infants' attention

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Research in social cognition suggests that infants' attention is educated in interactions (Zukow-Goldring, 1996). By synchronizing speech and gesture, caregivers recruit infants' attention and assist them in binding information from different modalities (Gogate et al., 2000). For 3-month-olds, Nomikou & Rohlfing (2011) showed that in natural interactions, mothers vocalize in a tight relationship with action "packaging" their actions acoustically and making language perceivable and tangible. We asked to which extent this input is coupled with the infant's behavior. We studied 13 mothers in interactions with their 3-month-old infants and calculated the overlap of each synchrony class (Nomikou & Rohlfing, 2011) with infant gaze, to test whether mothers synchronized speech and body movements more during the moments when the infant was looking at them rather than when s/he was looking away. We found that all synchrony classes occurred more during infant gaze at the mother: face ($t(11) = 13.18$; $p < 0.001$), head ($t(12) = 9.7$; $p < 0.001$) torso ($t(12) = 4.55$; $p = 0.001$) and hands ($t(12) = 2.4$; $p = 0.034$). Furthermore we analyzed whether the duration of synchrony events matched the duration of infants' gaze intervals. We found a

strong correlation between infant's gaze at the mother and mothers' face ($r = .986$; $p < 0.001$) and head ($r = .980$; $p < 0.001$). The results suggest that mothers adapt their behavior to the infants' gaze behavior, talking in synchrony with their bodily movements when in infants' focus of attention, thus reinforcing the input.

B-018

Powerful influence from humans in infancy

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Social learning enables infants to acquire the wealth of information, especially through communication. However, it is entirely unknown whether humans are the special source of information for infants' learning. To test this idea, we directly compared situations in which 12-month-old infants learn from either a human or a nonhuman agent and used an autonomous humanoid robot. Here we report that humans have a powerful influence on 12-month-old infants' learning. Infants were shown videos in which a human or a robot gazed at one of two objects. Results demonstrated that infants were able to follow both the human and robot gaze directions. In the test tasks, however, when presented with only the two objects, infants looked longer at the object that had not previously received directed gaze by the human, but not by the robot. This novelty preference indicates that human gaze facilitates infants' object processing. Infants also chose the target object gazed at by the human, rather than an alternative toy, but showed no such preference in the robot condition. This suggests that human gaze modulates infants' object preference. Importantly, mere longer fixation on the target object without the orientation of human gaze did not produce these effects. Together, these findings show that infants learn specifically from humans, suggesting that infants may be biologically predisposed to treat humans as a privileged source of information for learning.

B-019

The impact of intentional-historical information on children's naming of artifacts

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One prominent view on children's reasoning about artifacts (human-made objects) suggests that preschool children start to take an object's history and intended function into account when deciding about its category membership (Gelman & Bloom, 2000). However, this design stance is not independent of other cues, such as shape and function. Usually, one has to infer the artifact's history based on external features. In the present study, we asked preschool children to name ambiguous artifacts which were equally likely to be of intentional or of accidental origin. The artifacts and the procedure were adapted from the study by Gelman and Bloom. The information about the artifacts' creation was varied as we presented the same objects with different stories (accidental, intentional, goal-directed, no story). We used six everyday objects: paper hat, belt, knife, paintbrush, cup, and pair of glasses. We expected to replicate the results by Gelman and Bloom, namely that the history of objects would exclusively determine the names children assign to them. Our results showed that the intentional-historical information had an impact on children's decisions only in case of one object: the paper hat. In case of the other objects naming was consistently determined by the conventional form, even though the objects did not fulfil the assumed function. Overall, our results affirm the assumption that object history is only reliable when the object is ambiguous (Dennett, 1990). An artifact's identity is strongly dependent on the plausibility of the function defined by the overall shape.

B-020

Five-year-old children use imitation communicatively

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The vast majority of research on imitation has focused on its role as a learning mechanism. However, imitation also performs important social functions: children use imitation as a way to make themselves more similar to their group members. Beyond this, children may also use imitation communicatively, in order to convey social information to their interaction partners (Nadel, 2002; Over & Carpenter, 2011). For example, children may imitate in order to convey the message "I am like you". As a first step towards testing whether children (sometimes) use imitation communicatively and strategically within social settings, we measured whether, when they imitate, they show a model that they are doing so. Five-year-old children ($N = 16$) were given the opportunity to imitate a model under two different conditions (within-subjects). What differed between conditions was whether the model could see children's imitation of her action. In one condition, a barrier prevented the model from seeing unless children raised their arms high in the air. In the other condition, there was no barrier present and the model was able to see without any additional effort from children. Results showed that children were significantly more likely to imitate with their hands raised in the air in the barrier condition than the no barrier condition (McNemar's test, $p = .004$). This shows that children work to ensure that a model sees their imitation,

and thus suggests that, in some circumstances at least, they use imitation communicatively.

B-021

The influence of different task features on preschoolers' rational imitative behavior

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While rational imitation is well documented in infants (Gergely et al., 2002; Schwier et al., 2006; Zmyj et al., 2009), little is known about the development of this ability in preschool age. The key issue is to investigate the universality of rational imitation in older children and for different imitation tasks. The present study asked whether preschoolers take task-specific information (e.g., situational constraints of the experimenter) into account and adapt their imitative behavior accordingly. We presented 3- to 5-year-old preschoolers (N = 45) with two novel objects: the touchlight-task by Meltzoff (1995) and the obstacle-task (designed after Gergely & Csibra, 1997), and tested their imitation of an unusual action in two different conditions: without and with constraint of the experimenter. Preliminary results show that preschoolers' production of the (observed) unusual and (not observed) usual actions varied depending on the situational constraints of the model as well as on the type of imitation task. Three- to 5-year-old children demonstrated a different type of imitative behavior as compared with recent research on rational imitation in infants. In the obstacle-task, preschoolers seemed to recognize the situational constraints of the experimenter and imitated rationally. In contrast, in the touchlight-task, preschoolers over-imitated the demonstrated unusual action. The results indicate that preschoolers imitate observed actions selectively, dependent on task specific information such as the perception and encoding of the constraint, familiarity of the action, or salience of the action components.

B-022

The development of naming in children: empirical data and a new computational model of lexical access

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Lexical access plays a central role in early cognitive development and is thought to affect children's literacy development. Although the architecture of the mental lexicon has been extensively investigated, we know little about how the mechanisms underlying naming abilities develop in children. Through a combination of behavioural data collection and computational modelling, we investigated the development of naming and word knowledge in young English monolingual children aged 4 to 8 years. Assessment involved standardized and experimental tasks of picture naming, non-verbal semantics, word-picture verification and phonological abilities. The results provided a measure of semantics, phonology and lexical retrieval, which were used to construct typical developmental trajectories of these skills. The behavioural data were then used to calibrate a neurocomputational model of vocabulary development so that it simulated the key characteristics of the developmental trajectories observed in children. The model helps clarify the possible mechanisms underlying changes in naming abilities with age, as well as the causes of different types of naming errors observed children at different ages. We outline how the implemented model also provides a framework to capture atypical vocabulary development and to predict interventions to remediate word-finding difficulties in children.

B-023

The Roots of Normativity: 18-Month-Old Infants Intervene in Game Rule Violations

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Human infants do not only imitate idiosyncratic acts from adults, but from early on, they learn about the normative side of social (inter)actions: Many actions "ought" to be done in specific ways, because they are subject to social norms (Bruner, 1993; Tomasello, 2009). Interestingly, recent research has found that children as young as 2 to 3 years of age do not only imitatively learn actions from others normatively, but that they actively enforce learned norms on others (Rakoczy et al., 2008). Heretofore we do not know, however, whether the roots of normative reasoning are to be found in the second year of life. Since

games are considered paradigmatic cases of conventional norms (Searle, 1995), the current study assessed this question by exposing 18-month-old infants (N=60) to four game-like, rule-governed actions performed by an adult in a between-subjects design. In the game context, the model expressed confidence and knowledge (regarding how the game works) prior to performing the action. In the discovery context, however, the model expressed ignorance and uncertainty prior to performing the very same action (in the same confident manner as in the game context). Then, a puppet demonstrated an alternative action, and infants socially intervened (e.g., giving game-relevant objects to the puppet) more in the game context (M=0.87) than in the discovery (M=0.33) context, $t(51.21) = 2.31, p = .02$. This finding suggests that by 18 months of age, infants show basic skills of normative reasoning, and take into account the context and social cues prior to a demonstration of a game-like action.

B-024

Young Children Enforce Third-Party Entitlement Rights Selectively

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Recent developmental research has shed new light on an important aspect of social learning, namely learning how to do things “the right way” (Tomasello, 2009). This early appreciation for normativity is intriguingly documented by the finding that young children spontaneously enforce social norms on third parties (Rakoczy et al., 2008). An “ought”, however, also implies a “may” (Anderson, 1956), and thus it is an outstanding question whether young children also understand and enforce entitlement rights (i.e., one may or has the right to do something), and if they do, whether they rely on authority or on other contextual cues, such as property. The most convincing demonstration of understanding entitlement would be standing up for someone who is entitled to do X, but is prohibited from doing X by another individual. In a between-subjects design, three-year-olds (N=52) watched (in 8 trials) as an adult or a puppet (Norbert) introduced a game (or a toy). Then, the adult entitled a second puppet (Max) to play the game in a different way (or to play with his/Norbert’s toy). Subsequently, Norbert protested against Max who followed the adult’s permission. Children performed more counter-protest against Norbert when he was not the owner of the toy/leader of the game (Mdn=1.5) than when he was the owner or leader (Mdn=0), $U=188.5, p=.003$. This finding suggests that young children do understand the normativity of entitlement, that they consider contextual cues (i.e., property) beyond authority when reasoning about entitlement rights, and that they enforce a third party’s entitlement rights selectively.

B-025**ERPs to complete and incomplete actions in 7-month-old infants****M. Schönebeck and B. Elsner**

University of Potsdam, Germany

The purpose of this study was to investigate early electrophysiological correlates of the perception of complete and incomplete actions in 7-month-old infants, using EEG. The preliminary sample consists of 18 7-month-olds (10 females; mean age = 7.22 months, SD = 0.34). Infants were first familiarized to a person on video performing either a complete action with an object (CD: complete demonstration of target act) or an incomplete action (ID: target act never demonstrated). Next, all infants were repeatedly presented with pictures of the end states of the complete and the incomplete action, and ERPs for these two pictures were compared. Analyses focused on the Negative Component (Nc) and to positive and negative slow wave activity (PSW; NSW). It is expected that the experimental groups show different ERP-responses for the two pictures. Preliminary analyses of midline activity (Cz; Fz; Pz) indicate that infants in the ID-group assign more attention towards processing the ID-picture. Nc-amplitude is more negative for the ID- than for the CD-picture ($F(1,7) = 4.64$; $p = .068$). For the CD-group, the Nc-amplitude for the two pictures does not differ. Analyses of slow wave activity will be presented on the poster. Behavioural data shows that 18-month-olds infer the goal of an action from an incomplete demonstration (Meltzoff, 1995, Dev. Psychol.), and this study demonstrates electrophysiological correlates of this ability already in the first year of life.

B-026**The cat in front of the rat - interpretation of ambiguous spatial expressions in Hungarian typically developing children****R. E. Ivady and C. Pleh**Budapest University of Technology and Economics, Cognitive Science
Department

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Our study aimed to test the spontaneous interpretation of ambiguous spatial expressions in Hungarian Typically Developing preschool children in order to test the hypothesis that the computational load associated with the two different interpretations plays a significant role. Certain spatial expressions such as behind or left can be ambiguous: relying on the Frames of Reference (FoR) categorization they can be interpreted in an intrinsic way (X behind Y meaning X at the back of Y) or in a relative way (X behind Y meaning X further away from speaker than Y). Intrinsic FoRs describe a binary relation between X and Y, while relative FoRs define a ternary relation between X, Y and the position of the speaker,

thus relative expressions are computationally more demanding suggesting later acquisition. We tested this hypothesis by asking preschool children aged 3-6 years to place an object in front of or behind another in conditions where the referent object was a., a toy animal with salient intrinsic facet and head facing forward b., a toy animal with salient intrinsic facet but head turned 90 degrees to the side c., a human-shaped pawn with visible but not salient intrinsic facet d., a human-shaped pawn with no intrinsic facet. The results do not support the computational difficulty hypothesis, but show significant effect of facet saliency and highly idiosyncratic answers across children. Thus, while the computational account of FoRs might be valid on a theoretical level, actual language use seems to rely on different mechanisms.

B-027

Is it resulting or intentional action that young children tend to imitate?

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When children reproduce actions of others they can discriminate between the accidental and intentional actions (Meltzoff, 1995; Carpenter, et al. 1998). But it can be explained by the children tendency to imitate the successful action, cause usually we initiate the action for its result. That's why we need to explore if children prefer using the effectiveness or the intentionality as the base for reproducing observed action. In the wide range of research dedicated to this problem the adult's actions effectiveness was varied by different ways (Nielsen, 2006; Lyons, et al., 2007). They showed that children tend to overimitate adult's actions (or ignore their ineffectiveness), and that it was true only for 18-24 months. But the objects in these experiments were designed like containers with an interesting toy inside. We suppose that taking the toy out of the container may be more complicated action for the children to assess its operational composition. Would the age limit for other action types be the same? We demonstrated to 14- and 18-month children one series of two-step actions on objects that made interesting result occur. Some of the modeled actions were marked vocally as intentional, some were marked vocally as accidental. Those markers were varied between resultative action and action without result on each of the objects. 18-months reproduced the intentional action even when it hadn't result (and other action in the series was resultative). 14-months didn't prefer any demonstrated action when intentional action hadn't result.

B-028

Action Prediction may Benefit From Own Action Experience

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Motor activation during action observation may reflect online predictions of the observed action (Kilner et al., 2007). Infants show stronger motor activation during observation of actions for which they have more motor experience themselves (van Elk et al., 2008). We hypothesized that with increasing motor experience, action prediction of observed actions should become more accurate. Therefore, we tested proficient walkers (adults) and infants who are learning to walk (14-mo.-old) in an action observation setting. Participants observed an actor walking or crawling from one side of the scene to the other. Part of the movements were occluded. All stimuli were equal concerning duration, and the dimensions and position of the occluder. If reappearance would always occur at exactly the same time during the stimulusmovie, predictions could be based on that instead of on the movements of the actor. To avoid this, occlusion duration varied (320 versus 640ms) as a second factor. Accuracy of the observer's prediction was measured through the timing of their eye-movements towards the location where the actor would reappear. Preliminary data shows that adults were more accurate in their eye-movement timing when the observed action was walking. Furthermore, there was an effect of occlusion duration, with longer occlusion times leading to less accurate eye-movement timing. Testing with 14-month-old infants is in progress. Duration of walking experience in days will be used as a predictor of prediction accuracy for the crawling movements compared to the walking movements. We expect this difference to diminish with increasing walking experience.

B-029**Age-related and Age-independent Individual Differences in Strategic Social Behaviour Are Mediated by Impulse Control and Underlying Functions of the left DLPFC****N. Steinbeis, B. Bernhardt and T. Singer**

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Human social exchange is often characterized by conflicts of interest requiring strategic behaviour for their resolution. Little is known about the ontogeny of this behaviour. To investigate the development of the cognitive and neural mechanisms underlying strategic behaviour, we studied children's decisions while they played two types of economic exchange games, the Dictator and the Ultimatum Game, each differing in their demands of strategic behaviour. In two studies, one purely behavioural (N = 146; age range: 6.9-14.4 years) and another also including fMRI (N = 28; age range: 6.9 - 13.1 years) we could show an increase of strategic behaviour with age. This increase was best explained by developmental differences in impulsivity and associated brain functions of the left

dorsolateral prefrontal cortex (DLPFC) and not by age-related changes in social preferences. Furthermore, observed differences in cortical thickness of IDLPFC were predictive of differences in impulsivity and strategic behaviour irrespective of age. In addition, findings of age-independent involvement of IDLPFC were could be replicated in a separate sample of adults (N = 14). We conclude that egoistic behaviour in younger children is not caused by a lack of understanding right or wrong, but by the inability to implement behavioural control when tempted to act selfishly; a function relying on brain regions maturing only late in ontogeny.

B-030

Planning Ahead - Do Young Children Represent Their Partner's Tool-Choice in a Collaborative Task?

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Collaborative problem-solving requires that participants coordinate actions socially in order to achieve a joint task. Developmental research has shown that peers begin to successfully solve collaborative problems at 2-3 years of age. However, in previous tests, children could decide on the fly who will take over which role while they were performing the task. Thus, it remains unclear whether children solve these problems on a trial-and-error basis or if they can actually plan ahead the required actions. We therefore tested whether 3- and 5-year-old peer dyads are able to represent the problem solution and choose complementary roles prior to acting on a collaborative task. Children were tested in two conditions. In the bidirectional condition, each child had the choice of two tools and had to select a different tool. In the unidirectional condition, one child had only one tool and the other child had to choose the complementary one, taking into account the other's constraints. We found the 5-year-old children were more successful than 3-year old children ($F(1,20)=27.11, p<.001$). They selected the correct tools in both conditions, whereas 3-year-olds only succeeded in the bidirectional condition and only after having experienced the unidirectional condition. Apparently, it helped the 3-year-olds being 'forced' to attend to the partner's constraints. These results provide the first experimental evidence that, under certain conditions, 3-year-olds are capable of planning the division of labor in a collaborative task. They also demonstrate that joint planning undergoes significant development from 3 to 5 years.

B-031**Self-regulation skills among school-age children: The relationship with cognitive and academic achievements as well as with outcomes of a cognitive training****B. Studer-Luethi, C. Bauer and W.J. Perrig**

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Self-regulation of children, the ability to regulate thinking and behaviour, is closely related to their cognitive development. Furthermore, self-regulation is deemed a good indicator of children's academic learning potential. Another stream of studies revealed transfer effects of Working Memory (WM) trainings on non-trained cognitive abilities. Building upon these findings, firstly, we aimed to further discover the relationship between self-regulation skills and cognitive and academic achievements, and secondly, we aimed to investigate the moderating effects of self-regulation on outcomes of a WM training. To do so, we assessed self-regulation skills as well as the performance in cognitive and academic tests of 99 regularly developed school children. During four weeks, one part of each participating class trained daily with an adaptive WM task, whereas a second group of children did some other activities. On a general level, our analyses revealed transfer effects on cognitive tasks in the WM training group. Regarding the level of self-regulation skills, results disclosed that children with high self-regulation not only reached significant higher scores in the cognitive ability tasks (WM, intelligence and memory measures, executive functions) and academic measures (reading, math), but they also showed significantly better WM training outcomes compared to children with low self-regulation. This confirms prior findings and extends them by showing that self-regulation boosts engagement and success in a cognitive training experience. Our results hold the implication that the development of children's self-regulation skills should be promoted as early as possible as a means of fostering children's learning engagement and academic progress.

B-032**Children's reasoning about consistent language production and comprehension across individuals****K.R. Sullivan and L. Markson**

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Our knowledge of language generates both the speech we produce and our comprehension of others' speech. Importantly, the conventional nature of language implies

that all members of a language community share this knowledge, and thus use language in the same way. Two studies explored whether three-year-old children infer shared knowledge of lexical conventions based on consistency across individuals. Study 1 examined children's reasoning about how others produce language. Children watched video clips of four actors who labeled a series of novel objects. For each object, two actors used one novel label, while the other two actors used a second novel label. A real world example of this would be two people who speak one language, and two other people who speak a different language. The use of novel objects ensured that children could not evaluate the accuracy of these labels. Results indicated that children infer shared lexical knowledge between consistent speakers, predicting that they should continue to produce the same labels for additional novel objects. Study 2, currently in progress, uses a similar procedure to test children's reasoning about how others comprehend language. Children watch video clips of four actors who hear novel labels and respond by pointing to the referent objects. Preliminary results suggest that children track consistent comprehension across speakers, predicting that consistent actors will continue to point to the same objects in response to new labels. Together, these studies suggest that children recognize that underlying shared knowledge of language generates consistent production and comprehension across speakers.

B-033

Infants learn from multiple sources of visual information

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While research has suggested that infants have a preference for information that is statistically informative (Kidd et al., 2010; Swan & Kirkham, submitted), there are many other features in the natural visual world that infants may use in selecting where to attend and what to learn. In an eye-tracking experiment, we presented 8-month-olds with visual events that differed in both transitional probability and in perceptual salience, to examine which features would drive infants' looking behavior. Infants viewed sequences of three shapes that appeared in different locations according to three levels of spatio-temporal probability: deterministic (1.0), high (0.75) and low (0.5). Further, a between-subjects manipulation of perceptual salience meant that infants saw one shape that was more visually attractive than the other two shapes. Eye movements were recorded for trends in saccade latency and anticipatory looking, as infants discovered where each shape was most likely to appear. Results suggest that perceptual salience is weighted more heavily by infants in selecting which items to attend to and learn; that is, regardless of its associated probability, infants in each group showed evidence of better learning for the most visually attractive item. These results demonstrate that infants weight both perceptual salience and statistical reliability as indicators of where to orient when multiple sources of information are available. Findings are discussed within a framework of contextual learning in infancy,

considering how early learning may differ in the noisy natural world from what has been demonstrated under ideal laboratory conditions.

B-034

The development of multi-power number representation

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Developing symbolic number representation is a long process starting at around 2 years of age. While many studies investigated the appearance of the first natural numbers, it is less known how multi-digit numbers develop. In a previous work artificial number system learning was used to study the role of number notations in adults. Participants compared and added multi-power numbers in sign-value notations (similar to the Roman system) and in place-value notation (similar to the Indo-Arabic system). We found that sign-value system could be easier to use than place-value numbers. Explaining these results we proposed a natural multi-power number representation based on the numerical representation of objects. Sign-value notation that has a similar structure to the natural multi-power representation can be translated to the mental representation easier than the place-value notation. To investigate the development of this multi-power number representation we used comparison task to test the management of different notation systems in 6 years old children. To control the former experience with number notations, we measured single- and multi-digit Indo-Arabic number and Roman number reading ability. Like adults, preschool children could use sign-value numbers easier than place-value notation. Learning place-value notation did not depend selectively on multi-digit Indo-Arabic notation knowledge. Our results suggest that while natural multi-power representation is available in 6 years old children, place-value notation requires more abstraction that makes it difficult for them to learn Indo-Arabic notation.

B-035

Educating each other's attention: Mothers' and infants' eye-contact within natural interactions at 3 and 6 months of age

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The interaction between infant and caregiver is empowered by mutual attention. Senju and Csibra (2008) have shown infants' sensitivity to ostensive signals, such as eye-contact and argue that gaze following is rooted in these social signals. Following this approach, we

argue that infants' social environment educates their attention very early in development. We present data from 15 mothers-infant dyads at 3 and 6 months of the child's age during an everyday activity. We manually coded the 3 first minutes for gaze behavior and calculated the intervals of eye-contact. We found a correlation between the total duration of mothers' gaze towards the infant and the total duration of the infants' gaze at the mother (at 3 months: $r_{\text{Pearson}} = 0.66$; $p < 0.01$, at 6 months: $r_{\text{Pearson}} = 0.69$; $p < 0.01$). The infants who looked most at their mothers were those who were also most looked at. This indicates that the gaze of the mother may be affecting that of the infant. Furthermore, we found changes in gaze between the 3rd and 6th month. Over time, infants not only looked at their mothers significantly less ($t(14) = 2.71$; $p = 0.017$) they also looked for significantly shorter intervals ($t(14) = 2.90$; $p = 0.012$). Yet the total duration of eye-contact did not change significantly between the 3rd and 6th month. The mother seems to adapt to these changes as we found an increase in the overall duration of mothers' gaze at 6 months, but it was not significant.

B-036

To hear what isn't being said - A developmental analysis of understanding verbal irony

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In order to clarify the role of echo (Sperber, Wilson, 1992) in verbal irony, I conducted three studies with children aged 5 to 8. In the first study, short stories containing delusion or irony were shown to the children. I found that subjects understood the beliefs of the speaker better in case of false irony than in case of false delusion, even though understanding of both communicational situations requires second-order mentalization. In the second study, half of the false ironic and false delusive utterances were echoic, and half of them were not. The results showed that the echoic nature of an utterance facilitates its understanding, even if the utterance itself is not ironic. In the last study, I analysed the children's capacity to understand echoic and non-echoic irony and delusion, related to their performance in first- and second order mentalization tasks. Logistic regression did not show any relationship between second-order mentalization skills and the understanding of explicitly verbal irony. These results show that children tend to apply an echo-based, heuristic interpretational strategy, and therefore are able to interpret (explicitly echoic) ironic statements, even if they are not yet capable of higher-order mentalization. This notion questions the methodology of researches which utilise the performance registered in irony-understanding tasks as the obligate indicator of second-order mentalization skills. Furthermore, it could be the developmental base of Gibbs' findings (Gibbs, 2007), that adults understand irony without processing the literal meaning of ironic utterances. Keywords: verbal irony, echoic mention, theory of mind, heuristic strategies.

B-037**Effects of experimental communication factors on working memory performance****A.B. Turcsik, G. Farkas and D. Németh**

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Learning and memory tests are frequently used in experimental psychology as well as in the diagnostic methods of clinical and neuropsychology. We propose that learning and working memory performance can be highly influenced by the experimental context and the communication style of the experimenter, but this statement has not yet been proved by any research. In our first experiment, 25 undergraduate students were tested by four standardized tests of working memory, in two different conditions: live speech and recorded voice. Our results indicate significantly higher performance at recorded voice than live speech condition in complex verbal tests. In the second experiment, 36 undergraduate students were tested by Listening Span Test in three different conditions based on the extent of ostensivity. Our results represent that less ostensive-communicative context indicates the highest performance, and we suggest, that this sort of communication amends the subjects' memory performance. The results of our experiments point out that the communication style of the experimenter could have an effect on performance and could eventually modify the diagnosis.

B-038**Concept learning: typicality gradient depends on learning performance****Zs. Varnagy-Toth^{1,2} and M. Gyori¹**¹Institute for Psychology of Special Needs, Faculty of Special Education, Eötvös University (ELTE), Budapest, Hungary²PhD School in Psychology, Department of Cognitive Science, Faculty of Science, Budapest University of Technology and Economics (BME), Budapest, Hungary

Typicality gradient is one of the most robust phenomena of cognition that reflects the processing difference between typical and less typical stimuli. Even new born babies show it. Although it is generally assumed that a certain amount of experience is necessary to produce typicality gradient, yet no study has investigated how its steepness is related to learning. 25 neurotypical subjects (mean age 20.5, SD: 1.5; 11 female, 14 male) participated in the experiment. The authors applied the classical dot pattern task as used in Knowlton and Squire (1993). In this implicit learning procedure subjects tend to identify the

typical exemplars as category members more than the less typical members. We were especially interested in the individual variation of typicality gradient thus we calculated the value for each subject individually. Our findings show that the gradient varied greatly across individuals, ranging from steep gradient (96% slope) to more shallow gradients (5% slope, M: 58%, SD= 28.9%). Secondly, the gradient showed strong relationship with learning performance ($r = .89$, $p < .001$). On the one hand these findings show that the prototype effect may not be as robust on the individual level as suggested by previously available group level data. On the other hand they suggest that typicality is not merely a reflection of similarity relations in the physical world but is rather a function of learning.

B-039

Parental conversational strategies from the perspective of early language acquisition: Similarities and differences between typologically, geographically and culturally close languages

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Recent cross-linguistic studies of CDS carried out in the frames of the “Pre- and Protomorphology in Language Acquisition” indicated some similarities in caregiver conversational strategies among typologically close languages: notably between morphologically poor Austrian-German and French, and between morphologically rich Russian and Lithuanian. This study concerns adult interrogatives, seemingly one the most typical strategy of communicating with children in Russian and Lithuanian (~40%) in opposite to non-interrogative repetition strategy revealed in Austrian-German and French (~90%). The aim of the study was to investigate the distribution of a variety of interrogatives in Russian and Lithuanian CDS. The analysis was based on the longitudinal data (61 hours) of a Russian boy and a Lithuanian girl. Both subjects are typically-developing monolingual children, similar in age (2;0-2;8), social characteristics and linguistic age (MLU development). Our results have shown that with the exception of a few differences between the distribution of pragmatic (metalinguistic/conversational) and formal (yes/no-/or-questions) subtypes, interrogatives in both corpora are generally used for the same conversational purposes: Their structural (repetitions / expansions / reformulations / corrections etc.), positional (reactions / initiatives), pragmatic, and formal characteristics are practically identical. This evidence could indicate a need for a general discussion of the universal (or regional) aspects of caregiver strategies. On the one hand, a correlation between frequent conversational strategy and the type of language can be quite identified,

but, on the other hand, we still need more comprehensive study to verify this hypothesis, and to find out other possible impact factors as well.

B-040

What helps children to acquire new object names on the basis of unobservable information?

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P.Bloom (2000) states the social character of children's ability to fast map. He supposed that among simultaneously given observable and unobservable information children would prefer remembering the unobservable one because it was verbally transmitted by adults and wasn't available to the visual perception. In our research we examined what helps children to acquire new object names on the basis of the unobservable information. We told our three- and four- year-old participants the internal color of the new artificial object as the unobservable information along with the information about its name and the external color. Additionally we tested children's color naming competence. Contrary to P.Bloom's expectations we found that the four-year-olds were equally successful in remembering both the observable and the unobservable information. But the three-year-olds' performance in acquiring the unobservable information depended on their color naming competence - those children who couldn't name the basic colors couldn't recall the object's internal color and half of those who could name colors, could recall it (after a one-week delay). Thus lexical competence in the task-relevant domain is necessary but not sufficient condition for acquiring the unobservable information. We designed the meaningful objects for our second experiment in order to a child could expect it to have some internal color (such as a house). The three-year-olds performed significantly better in this condition (among those who could name the basic colors). Thus acquisition of the new object names is determined by both the conceptual expectations and the lexical competence in the task-relevant domain.

B-041

Do you still follow me when I don't walk the talk?

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Imitation studies offer an intriguing insight into developmental processes in the preverbal child. This study uses the method of imitation to gain further understanding of the link between language development and intention understanding. It has been shown that children use intentions to acquire new words (Tomasello & Barton, 1994, *Dev. Psychol.*)

and that they use verbal cues to infer intentions (Carpenter, Akhtar & Tomasello, 1998, *Infant Behav. & Dev.*). But can they also understand words as cues to intentions? We tested how one-year-old children react when a verbally announced intention is followed by an incongruent action. 36 healthy, German children from 14 to 16 months (18 females, $M = 15.59$ months, $SD = 0.75$) were observed in an imitation setting with six dichotomously designed toys (to show e.g. 'up' or 'down'). The congruent group heard the experimenter announce a certain action and hereafter saw that very action demonstrated (hear 'up', see 'up'). The incongruent group heard an announcement, but afterwards saw the experimenter accomplish the contrary action (hear 'up', see 'down'). The control group received no demonstration for two toys and saw a demonstration accompanied by artificial words for the remaining toys (hear 'niff', see 'up'). Results indicate that the incongruent group imitated the observed action less often in comparison with the remaining groups, $t(33) = 1.8$, p (one-tailed) < 0.05 . Seemingly, the 14- to 16-month-old children were less inclined to imitate when a person does not do as she says or 'doesn't walk the talk'.

B-042

Motion cues evoke anticipatory shifts of covert attention during action observation

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Human gestures that contain directional information trigger covert shifts of attention into the direction indicated by the stimulus (Daum & Gredebäck, in press). This covert attentional modulation is interpreted as anticipation of a potential action goal and is shown also by infants that observe a static picture of a grasping hand (Daum & Gredebäck, 2011). We applied a spatial cueing paradigm (Posner, 1978) to investigate the influence of motion cues on covert attentional processes during action observation in infancy. Cues were presented that moved from the periphery toward the center of the screen and disappeared, followed by the presentation of a target stimulus at a peripheral location congruent or incongruent to the motion direction of the cue. Saccadic reaction times (SRT) upon the appearance of the target were assessed via eye tracking. A natural grasping movement yielded shorter SRT on congruent targets in 7- as well as in 5-month-olds. A geometrical object that contained some of the hand's biological motion properties resulted in a congruency effect only in 7-month-olds. No effect was observed with a linear moving object, nor did a grasping hand that was moved backwards result in a spatial cueing effect. Biological motion supports early perception of directional information. Both low-level visual analysis of motion properties as well as experience with hands as agents may help infants to interfere goal-directedness from observed actions. The lack of a cueing effect in the backward hand condition may be due to an interference of these two processes.

B-043**Learning styles: implications on pedagogy****H. Zenakou**

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The ability to communicate successfully in the classroom according to one's personal learning style is essential component of the learning process. Constructive interaction between pupils and the teacher can only occur, provided that the teacher is well aware of each pupil's dominant learning style. Learning styles refer to the cognitive modalities people use in the process of gaining and mastering knowledge. People learn in different ways. Learning styles can be observed and measured using tests according to the age of the subjects. Learning styles instruments are widely used over the past 20 years and gain great interest among students, researchers and teachers. Learning styles is a complex field in research. There are over 70 learning styles' models identified and an extended number of instruments, that measure pupils' or students' preferences. The most important part is their influence on pedagogy provided that teachers are aware of their students learning preferences. Learning style inventories provide details of different learning preferences. Teachers' knowledge of their students learning preferences can help learners to learn through tailor-made activities, excel at school or at the university, since they can match their teaching style to their students' preferred learning style. There are several researches on learning styles that reveal learning styles can be used to increase the self-awareness of students and teachers regarding their strengths and weaknesses as learners and tutors. The present study examines the impact of learning styles and their instruments on pedagogy.

B-044**Prelinguistic infants use vocalizations to communicate intentionally****T. Grünloh and U. Liszkowski**

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We investigated how parental gestural cues might support acquisition of generics, unique linguistic devices that predicate properties of kinds (e.g., *Birds* lay eggs). Predictions were informed by the "generics-as-default" hypothesis (e.g., Gelman, 2004), which holds that a learner assumes reference is to the generic category unless there is marking to suggest otherwise--learners' task is to filter out instances of particular reference (e.g., this/my/the birds). Thus, parents would be predicted to provide many gestural cues to highlight particular reference. Study 1 examined gestures enacted by 12 parents with their 2-year-old children. Parents used toy animals to convey facts about either particular instances or

generic kind categories. We identified generic and particular utterances and co-occurring gestures. Three classes of gestures were observed: object-focused (e.g., pointing to animal), part-focused (e.g., pointing to animal part), and action-focused (e.g., demonstrating action). Object-focused gestures were significantly more frequent during particular utterances ($p=.03$), whereas the other types of gestures did not differ between particular and generic. Study 2 addressed whether parents' gestures during particular and generic utterances were informative. We removed the sound from sections of footage featuring parents' generic and particular reference, and 16 adults guessed what parents were discussing. Participants were more accurate in guessing what parents were saying for particular vs. generic ($p=.002$). Taken together, our results indicate that parents provide more object-focused gestures during particular vs. generic reference *and* that these gestures are informative, lending support to the idea that parents preferentially provide gestural cues to facilitate children's detection of particular reference.

Restaurants in the area:

Parázs Thai Restaurant
 Address: 8, Jókai St., Budapest, 1066
 Opening hours
 Mon–Fri: 10:00–24:00
 Sat–Sun: 12:00–24:00
 Web: www.parazspresszo.com
 Reservation: +36 1 950 3770

Napos Oldal Vegetarian Salad Bar
 Address: 7, Jókai St., Budapest, 1066
 Opening hours
 Mon–Fri: 10:00–20:00
 Sat: 10:00–14:00
 Web: www.naposoldal.com
 Reservation: +36 1 354 0048

Indigo Indian restaurant
 Address: 13, Jókai St., Budapest, 1066
 Opening hours
 Mon–Fri: 12:00–23:00
 Sat–Sun: 12:00–23:00
 Web: www.indigo-restaurant.hu
 Reservation: +36 1 428 2187

Olasz Tészták Háza Italian Restaurant
 Address: 17, Podmaniczky St., Budapest, 1065
 Opening hours
 Mon–Fri: 11:30–22:00
 Sat: 11:30–22:00
 Web: olasztesztakhaza.uw.hu
 Reservation: +36 20 922 0005

Wasabi Running Sushi and Wok Restaurant
 Address: 21, Podmaniczky St., Budapest, 1065
 Opening hours
 Mon–Fri: 11:30–23:30
 Sat–Sun: 11:30–23:30
 Web: www.wasabi.hu

Reservation: +36 1 374 0008

Zorbos Taverna Greek Restaurant
 Address: 18, Podmaniczky St., Budapest, 1065
 Opening hours
 Mon–Fri: 10:00–24:00
 Sat: 12:00–24:00
 Sun: 12:00–22:00
 Web: <http://www.zorbastaverna.hu/>
 Reservation: +36 1 332 7900

Szlovák – Slovakian Restaurant
 Address: 17, Bihari János St., Budapest, 1055
 Opening hours
 Mon–Fri: 11:00–02:00
 Sat–Sun: 11:00–02:00
 Web: –
 Reservation: +36 1 269 3108

For more, please visit:
<http://en.bpex.hu/>

PHARMACY 0–24
 Teréz Patika
 41, Teréz krt., Budapest, 1067



Course Directors

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Faculty:

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Guenther Knoblich, Department of Cognitive Science, CEU, Budapest, Hungary

Beatrice Longuenesse, Department of Philosophy, New York University, USA

Christopher A. B. Peacocke, Department of Philosophy, Columbia University, New York, USA

Phillipe Rochat, Department of Psychology, Emory University, Atlanta, USA

Paul Snowdon, Department of Philosophy, University College London, UK

Manos Tsakiris, Department of Psychology, Royal Holloway, University of London, UK

Guest Speakers:

Maurice Bloch, Department of Anthropology, London School of Economics, UK

Gyorgy Gergely, Department of Cognitive Science/Cognitive Development Centre, CEU, Budapest,
Hungary



BRIEF COURSE DESCRIPTION

The course aims to present the state of the art in research on the self from philosophy, psychology, cognitive neuroscience, sociology, and cognitive anthropology. Themes revolve around the nature of the self, as revealed through self-consciousness, body perception, action and joint action, and its embedding in society and culture. Historical and developmental perspectives provide other angles on the self. The course presents a unique opportunity for interdisciplinary discussion on the self from multiple perspectives. It is directed at advanced graduate students, postdoctoral fellows and junior faculty working in philosophy, psychology, cognitive neuroscience and cognate disciplines.

The course will provide a *tour de force* through major questions on the nature of the self and its embedding in its environment. In particular, we are hoping to bring together researchers – both faculty and students – working on the self who would not ordinarily interact in their usual professional settings – even though their work has great relevance for each other. The aim is to facilitate the pursuit of interdisciplinary discourse, research and learning that will enrich our understanding of the self.

The course will be taught by a faculty consisting of internationally acknowledged leading experts of these fields of inquiry from a variety of European countries as well as from the United States. The course will begin with introductory lectures to build common ground between the researchers from different disciplines. After the introductions, all segments will be held in a seminar format, with faculty members leading the seminar, and responses/commentaries delivered by teams of students. Each day of the course will feature seminars in two themes from two different disciplines. There will be specific time devoted to smaller group discussions, also led by a member of the faculty, and also opportunities for selected students to give talks and poster presentations. Alongside the regular program of the course there will be talks and discussions aimed at the general public held by invited speakers, including the developmental psychologist, Prof Gyorgy Gergely (CEU), and the cognitive anthropologist, Prof Maurice Bloch (LSE).



Central European University's summer school (CEU SUN), established in 1996, is a program in English for graduate students, junior or post-doctoral researchers, teachers and professionals. It offers high-level, research-oriented, interdisciplinary academic courses as well as workshops on policy issues for professional development, taught by internationally renowned scholars and policy experts (including CEU faculty). Application from all over the world is encouraged. Financial aid is available.

Application deadline: February 15, 2012

For further academic information on the course and on eligibility criteria and funding options
please visit the web site in early November at
<http://www.summer.ceu.hu>

CEU Summer University

✉ P.O. Box: Budapest 5, P.f.: 1082, H-1245

☎ (36 1) 327 3811, Fax: (36-1) 327-3124

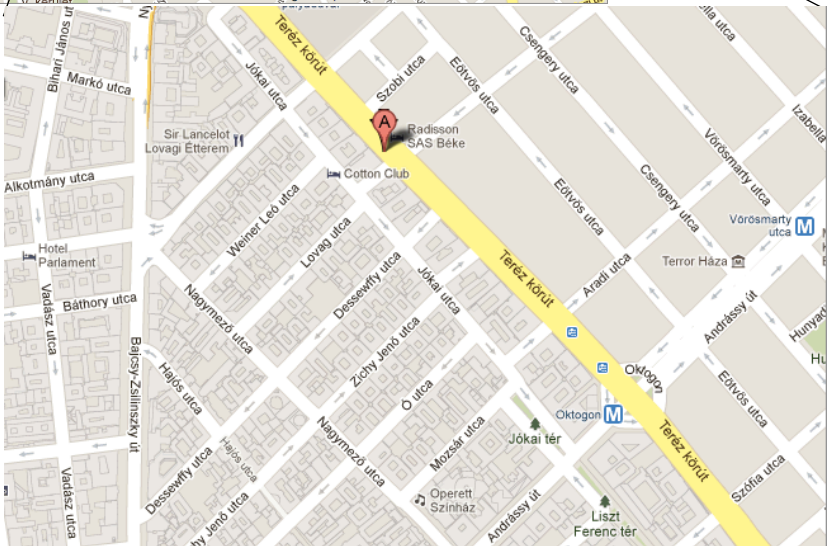
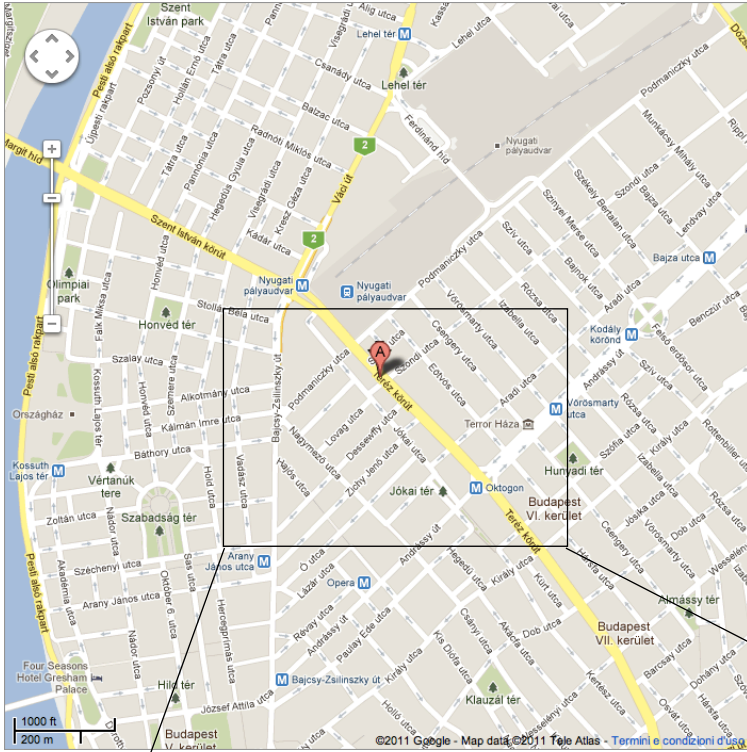
E-mail: summer@ceu.hu

Skype: ceu-sun

Non-discrimination policy statement

Central European University does not discriminate on the basis of – including, but not limited to – race, color, national and ethnic origin, religion, gender or sexual orientation in administering its educational policies, admissions policies, scholarship and loan programs, and athletic and other school-administered programs.

MAPS



CONFERENCE DINNER, SATURDAY, 7 PM

