BCCCD

2011 Budapest CEU Conference on Cognitive Development

Program and Abstracts

2011.**BccCD**

Budapest CEU Conference on Cognitive Development

organized by
Cognitive Development Center
Central European University

http://cognitivescience.ceu.hu
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14-16 January, 2011, Budapest

CONFERENCE ORGANIZATION

The conference is a successor of the Opening Conference of the CEU Cognitive Development Centre held in January 2010. The great success of the conference motivated us to invest effort in establishing a tradition and organizing it every year. The conference is organized by the recently established **Cognitive Development Center** at CEU, led by Professors Gergely Csibra and György Gergely.

CONFERENCE CHAIR

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ORGANIZING SECRETARIAT

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CONFERENCE VENUE

ART'OTEL Budapest****
Bem rakpart 16-19.
H-1011 Budapest, Hungary
GPS: 47° 30' 8.9496" N, 19° 2' 22.758" E

January 14th

8.00-15.00 Registration

8.45-9.00 Welcome

9.00-10.10 Keynote lecture: **Ellen M. Markman** (Stanford University)

How children generalize what they have learned: **Factors that affect the scope, importance, and robustness of generalization**

10.10-10.30 Coffe break

10.30-12.30 Invited Symposium

Integrated approaches to phonological and lexical development (Organizer: Thierry Nazzi)

Building phonetic categories and lexical representations in bilinguals: a look at input properties	Laura Bosch and and Marta Ramon-Casas (Universitat de Barcelona)
Words and infants' phonetic category learning	Dan Swingley (University of Pennsylvania)
Learning of phonotactics regularities: implications at the lexical level.	Thierry Nazzi and Nayeli Gonzalez Gomez
Relating perception and production in phonological development: Experimental findings	Marilyn Vihman (University of York)

12.30-14.00 Lunch break

14.00-16.00 Invited Symposium

Development of social cognition in the first two years of life (Organizer: Ulf Liszkowski)

Representational preconditions for understanding other minds	Ágnes M. Kovács (CEU, Budapest)
A developmental account of 'Infant False Belief' understanding	James Stack and Charlie Lewis (Lancaster University)
Prelinguistic communication and social cognition	Ulf Liszkowski (MPI, Nijmegen)
Developmental relations between an implicit and an explicit understanding of the mind. Findings from a longitudinal study.	Beate Sodian, Claudia Thoermer, Susanne Kristen and Hannah Perst (University of Munich)

16.00-16.30 Coffee break

16.30-18.30 Invited Symposium

Developmental origins of property ownership (Organizer: Ori Friedman)

Concepts of property in non-human primates	Sarah Brosnan (Georgia State University)
Children's and Adult's intuitions regarding the acquisition of property	Patricia Kanngiesser, Nathalia Gjersoe and Bruce M. Hood (University of Bristol)
Possession and morality in young children across cultures	Philippe Rochat (Emory University)
Preschoolers value ownership more strongly than do adults	Ori Friedman, Karen R. Neary (University of Waterloo)

18.30-19.30 Reception dinner

19.30-20.45 Poster Session A

January 15th

8.30-9.45 **Poster Session B**

9.45-10.30 **Coffee break**

10.30-12.30 **Regular Symposium**

Searching the truth about false belief understanding (Organizer: Albert Newen & Leon de Bruin)

Theory of Mind and Levels of Understanding	Josef Perner (University of Salzburg)
Do infants really understand false beliefs?	Victoria Southgate (University of London)
The Person Model Theory and False Belief Understanding	Albert Newen (Ruhr-Universität Bochum)
Is Implicit False belief Understanding Universal?	Leon de Bruin (Ruhr-Universität Bochum)

12.30-14.00 **Lunch break**

14.00-15.10 **Keynote lecture: Josep Call** (Max Planck Institute for Evolutionary Anthropology)

Memory and meta-memory in the great apes

15.10-15.20 **Break**

15.20-17.20 **Invited Symposium**

Comparative aspects of social cognition: caveats and perspectives (Organizer: József Topál)

Homology or Analogy: Both help to understand the evolution of human behaviour.	Juliane Kaminsky (MPI Leipzig)
Development of social mind: Perspective from Developmental Cybernetics	Shoji Itakura (Kyoto University, Deptartment of Psychology)
Dog and wolf cognition: Lessons for and from the study of human cognition	Zsófia Viranyi (Vienna University, Wolf Science Center)
Dogs' receptivity to human social-communicative cues: "natural pedagogy" or "artificial peDOGogy"?	József Topál (MTA, PKI, Hungary)
Discussant	Ádám Miklósi (Eötvös Loránd University, Budapest)

17.20-17.40 **Coffee break**

17.40-19.40 **Regular Symposium**

The role of prosody in guiding language learning in pre-lexical infants (Organizer: Mohinish Shukla)

Using Prosody to Bootstrap Word Segmentation in a More Realistic Learning Environment	Constantine Lignos and Charles Yang (University of Pennsylvania)
Isolated Words Enhance Statistical Learning By 9-Month-Old Infants	Casey Lew-Williams, Bruna Pelucchi and Jenny Saffran (University of Wisconsin-Madison)
Prosody Guides Statistical Speech Segmentation And Word Learning In 6- Month-Olds	Mohinish Shukla[1], Katherine S. White[2] and Richard N. Aslin[1] ([1]University of Rochester, [2]University of Waterloo)
Learning Two Grammars Through Prosody: 7-month-old Bilinguals' Acquisition of the Word Order of their Native Language	Judit Gervain[1] and Janet Werker[2] ([1]CNRS-Universite Paris Descartes, [2]University of British Columbia)

20.15 **Dinner - Optional**

January 16th

9.00-11.00   **Regular Symposium**

On the early development of memory subsystems (Organizer: Ildikó Király)

The first buffer of visual information: Iconic memory in infants	Zsuzsa Káldy and Erik Blaser (University of Massachusetts Boston)
Selective imitation in a deferred imitation paradigm – Can eye-tracking provide a deeper understanding?	Gabriella Óturai, Thorsten Kolling, Laura Rubio Hall, Florian Remmers and Monika Knopf (Goethe University Frankfurt)
The emergence of specific event memories: the role of narratives in encoding	Ildikó Király and Erna Halász (Eötvös Loránd University, Budapest)
Memory development in infancy from a cross-cultural perspective: Deferred imitation in 6-, 9-, and 18-month-old German and Cameroonian Nso infants	Claudia Goertz[1], Bettina Lamm[2], Sonja Borchert[1], Frauke Graf[1], Thorsten Kolling[1], Heidi Keller[2] & Monika Knopf[1] ([1]Goethe University, Frankfurt, [2]University of Osnabrück)

11.00-11.30   **Coffee break**

11.30-13.30   **Regular Symposium**

Probing the youngest brains: exploring newborns' and young infants' perceptual abilities using NIRS (Organizer: Judit Gervain)

The left lateralization of language at birth: the native vs. a non-native language	Lilian May[1], Krista Byers-Heinlein[2], Judit Gervain[3] and Janet Werker[1] ([1]University of British Columbia, [2]Concordia University, [3]CNRS-Universite Paris Descartes)
Tick-tock and bim-bom: the origins of prosodic and rhythmic grouping	Judit Gervain[1], Inga Vendelin[2] and Emmanuel Dupoux[2] ([1]CNRS-Universite Paris Descartes, [2]CNRS-ENS-EHESS)
Imaging the developing infant social brain using fNIRS and fMRI	Sarah Lloyd-Fox (Birkbeck, University of London)
Consolidation and forgetting in the neonate brain	Silvia Benavides-Varela[1], David M. Gomez[1], Francesco Macagno[2] and Jacques Mehler[1] ([1]SISSA, Trieste and [2]Saint Maria della Misericordia Hospital, Udine)

Budapest CEU Conference on Cognitive Development

Keynote Lectures

HOW CHILDREN GENERALIZE WHAT THEY HAVE LEARNED: FACTORS THAT AFFECT THE SCOPE, IMPORTANCE, AND ROBUSTNESS OF GENERALIZATION

Ellen M. Markman

MEMORY AND META-MEMORY IN THE GREAT APES

Josep Call

Invited Symposia

INTEGRATED APPROACHES TO PHONOLOGICAL AND LEXICAL DEVELOPMENT

Building phonetic categories and lexical representations in bilinguals: a look at input properties
Laura Bosch & Marta Ramon-Casas

Words and infants' phonetic category learning
Dan Swingley

Learning of phonotactic regularities: implications at the lexical level.
Thierry Nazzi and Nayeli Gonzalez Gomez

Relating perception and production in phonological development: Experimental findings
Marilyn Vihman

DEVELOPMENT OF SOCIAL COGNITION IN THE FIRST TWO YEARS OF LIFE

Representational preconditions for understanding other minds
Ágnes Melinda Kovács

A developmental account of 'Infant False Belief' understanding
James Stack and Charlie Lewis

Prelinguistic communication and social cognition

Ulf Liszkowski

Developmental relations between an implicit and an explicit understanding of the mind: Findings from a longitudinal study
Beate Sodian, Claudia Thoermer, Susanne Kristen and Hannah Perst

DEVELOPMENTAL ORIGINS OF PROPERTY OWNERSHIP

Concepts of property in non-human primates
Sarah F. Brosnan

Children's and Adults' intuitions regarding the acquisition of property
Patricia Kanngiesser, Nathalia Gjersoe and Bruce M. Hood

Possession and morality in young children across cultures
Philippe Rochat

Preschoolers value ownership more strongly than do adults
Ori Friedman and Karen R. Neary

COMPARATIVE ASPECTS OF SOCIAL COGNITION: CAVEATS AND PERSPECTIVES

Homology or Analogy: Both help to understand the evolution of human behaviour.
Juliane Kaminski

Development of social mind: Perspective from Developmental Cybernetics
Shoji Itakura

Dog and wolf cognition: Lessons for and from the study of human cognition
Zsófia Virányi

Dogs' receptivity to human social-communicative cues: "natural pedagogy" or "artificial peDOGogy"?
József Topál

Regular Symposia

SEARCHING THE TRUTH ABOUT FALSE BELIEF UNDERSTANDING

Theory of Mind and Levels of Understanding
Josef Perner

Do infants really understand false beliefs?
Victoria Southgate

The Person Model Theory and False Belief Understanding

Tick-tock and bim-bom: the origins of prosodic and rhythmic grouping
Judit Gervain, Inga Vendelin and Emmanuel Dupoux

Imaging the developing infant social brain using fNIRS and fMRI
Sarah Lloyd-Fox

Consolidation and forgetting in the neonate brain
Silvia Benavides-Varela, David M. Gomez, Francesco Macagno and Jacques Mehler

POSTER SESSION A

POSTER SESSION B

Is Cooperation Relevant Enough to Copy? Imitation of Goal-Directed Action Demonstrated by Single vs. Two Cooperating Models in Preschoolers
R. Takacs and K. Egyed

Moral Intuitions in Early Development
C. Passos-Ferreira and P. Rochat

Early birds: development of metaphor comprehension
N. Pouscoulous and M. Tomasello

Eye Gaze and Task Demand in 2-to-3-year-olds Belief Reasoning
L. Wang and A. M. Leslie

When the to-be-remembered feature is an agent's goal: infant WM capacity for goal-relevant features
M.M. Kibbe and A.M. Leslie

Anticipation as an Alternative for Understanding Imitation Activity
A. Jedediah and M.H. Bickhard

Differential effects of communicative presentation on the encoding of visual features vs. numerosity of sets of objects in 9-month-old infants
M. L. Chen, Á. Volein, Gy. Gergely and G. Csibra

Sensitivity to social dominance relationships in human infants
O. Mascaro and G. Csibra

Trajectory as an agency cue in dogs
T. Tauzin, A. Csík, J. Topál and Gy. Gergely

Keynote Lectures

KL1
HOW CHILDREN GENERALIZE WHAT THEY HAVE LEARNED: FACTORS THAT AFFECT THE SCOPE, IMPORTANCE, AND ROBUSTNESS OF GENERALIZATION

Ellen M. Markman
Stanford University

A fundamental component of learning is how to extend what was learned to new exemplars, situations, and contexts. Recent advances in the field have revealed that accumulating statistical evidence over time is only one of the factors that affects generalization. Moreover generalization is itself multifaceted: Is the new information deemed applicable to a narrow or broad range of exemplars or situations? Is the information acquired construed as central, definitive, essential or as less important? Is the generalization robust, made with confidence, or tentative and easily revised? To sort all of this out, children rely on a variety of sources of information including (a) possible domain specific differences (b) prior knowledge (c) linguistically conveyed information such generic versus non-generic language (d) other communicative and social means of conveying information such as pragmatics, intentional versus accidental actions, the pedagogical stance, and trust in testimony. I will review recent research that highlights how children navigate these complicated issues.

KL2
MEMORY AND META-MEMORY IN THE GREAT APES

Josep Call
Max Planck Institute for Evolutionary Anthropology

Over the years research on memory has contributed in significant ways to the growth of the field of comparative cognition. In recent years two aspects in particular have been playing an increasingly important role: episodic-like memory and meta-cognition. Whereas some studies have shown that various species possess certain elements of human episodic memory, others have shown responses that are consistent with metacognitive judgments. However, there has been little effort to relate these two areas from a comparative perspective. In this talk I will present what is known about these two areas in the great apes and relate them with other aspects of the cognition of the great apes such as the appearance reality distinction.

Invited Symposia

INTEGRATED APPROACHES TO PHONOLOGICAL AND LEXICAL DEVELOPMENT

Organizer
Thierry Nazzi (CNRS - Universite Paris Descartes)

Participants
Dan Swingley (University of Pennsylvania)
Marilyn Vihman (University of York)
Laura Bosch (Universitat de Barcelona)

In this symposium, different papers will address the issue of phonological and lexical development. While many studies have explored phonological and lexical development for decades, integrated approaches to these issues have recently received renewed interest. The papers that will be presented will explore this topic, in an effort to specify the links between the properties of the input (in terms of statistics and acoustics), phonological acquisition, and word learning at both the perceptual and production levels. The first paper will present data investigating how differences in phonetic variability in the input might be related to differences in the pattern of phonological acquisition observed in monolingual versus bilingual infants. The second paper will discuss the proposal that phonetic category and lexical development might be integrated right from the start. The third paper will explore the links between the acquisition of a phonotactic bias and word form segmentation and lexical acquisition. The last paper will address the issue of the relation between production templates and word learning and recognition. Taken together, these talks will give a diverse sample of the kind of issues currently being investigated in the field of early language acquisition.

Building phonetic categories and lexical representations in bilinguals: a look at input properties

Laura Bosch & Marta Ramon-Casas
University of Barcelona

Bilingual infants differ from monolinguals in the developmental pattern they follow when building and stabilizing certain native vowel contrastive categories. A U-shaped pattern has

been identified relative to changes in phonetic discrimination during the first year of life. Once in the lexical stage, bilingual toddlers do not always react to a vowel mispronunciation in word recognition tasks, especially when the change involves a vowel that is contrastive in just one of their phonological systems. Factors such as frequency and distributional properties of sounds in both systems, or the cognate status of words in both lexicons, have been considered in order to explain bilinguals' results. However, little attention has been directed towards the specific characteristics of the input to the young bilingual language learner. Production data from parents differing in language dominance, age of acquisition of an L2 and language use, may provide critical information to better understand bilinguals' protracted processes in establishing certain native vowel category boundaries.

In this talk, results from a study based on the analysis of vowels extracted from speech samples produced by two groups of adult participants, coming from monolingual and bilingual environments and differing in the use of their L2, will be offered. Separate analyses of the target vowels at the phonetic and lexical levels revealed interesting between-group differences. The greater presence of phonetic variability and inconsistencies in vowel category selection in word production characteristic of the bilingual group are input factors that may hinder the stabilization of contrastive vowel categories in bilingual's early lexicon.

Words and infants' phonetic category learning

Dan Swingley
University of Pennsylvania

Infants' learning of native-language phonetic categories is, by consensus, the outcome of a distributional analysis of experienced speech sounds. Virtually without exception this process is described as a cluster analysis over a projection of isolated speech sounds into a perceptual space. I will suggest that instead, phonetic category learning may be integrated with word-form learning right from the start. The mechanism of this integration is suggested by a speech-category learning study conducted with adults, in which alignment of words and subphonological phonetic categories is shown to aid learning of these phonetic categories. One conclusion suggested by this line of thinking is that previously reported correlations of perception performance and vocabulary size may be bidirectional.

Learning of phonotactic regularities: implications at the lexical level.

Thierry Nazzi and Nayeli Gonzalez Gomez
CNRS-Université Paris Descartes

Several studies have investigated infants' acquisition of the phonological regularities of their native language at the lexical level, by showing that infants around 10 months of age start preferring lists of words that have a more versus less frequent phonological structure.

In the first part of our talk, we explore whether a similar acquisition pattern of preferences can be found for labial-coronal (LC) over coronal-labial (CL) words, a bias classically interpreted in terms of production constraints but that could also be explained in terms of relative frequency of frequent LC and less frequent CL words in many languages including French, the language used here. In the first study, we found that a preference for bisyllabic LC words emerges between 6 and 10 months of age in French-learning infants. These findings establish an early perceptual equivalent of the LC bias initially found at the onset of word production. In a second study, we replicated the emergence of the LC bias by 10 months, using CVC words. This new study further allowed us to establish that the relationship learned is a non-adjacent relationship between the two consonants.

In the second part of this talk, we will present findings exploring the implications of the acquisition of this LC bias for word learning. First, we will present data on word segmentation at 10 months, exploring whether LC words are better segmented than CL words. Second, we will discuss data on the relative ease of acquisition of new LC versus CL words at 16/20 months.

Relating perception and production in phonological development: Experimental findings

Marilyn Vihman
University of York

Child templates can be taken to be responses to challenges encountered in production, such as difficulties in speech planning and articulation. But do they influence the way children process language, affecting memory for new word forms and the recognition of known words? Thirty-eight two-year-olds were first recorded at home in naturalistic play with a parent. Once their speech had been transcribed and their word forms analysed for templatic patterns, each child was tested in two tasks: (a) nonword learning (with a picture-book) and (b) familiar object identification, with mispronounced object names. Both the nonwords and the mispronunciations were chosen to fit either the child's idiosyncratic word template (in forms) or another child's potential template (out forms). All real words used as stimuli were familiar to the child; nonword out forms were within the child's repertoire. All patterns were used whenever possible as in forms for some children, out forms for others.

Preliminary results reveal clear effects of production templates on language processing. (a) Word learning: Children are better at learning the form-meaning pairing in the case of in forms (based on referent identification only, not production) – although this effect is restricted to longer words (disyllables); monosyllables show no effect. (b) Word recognition: Although there is no significant difference between the proportion of correct vs. incorrect responses for in vs. out form mispronunciations, response time is significantly shorter for in forms when only correct responses are analyzed.

IS-002
DEVELOPMENT OF SOCIAL COGNITION IN THE FIRST TWO YEARS OF LIFE

Organizer

Ulf Liszkowski (MPI, Nijmegen)

Participants

Ágnes Melinda Kovács (Central European University, Budapest)

James Stack and Charlie Lewis (Lancaster University)

Ulf Liszkowski (MPI, Nijmegen)

Beate Sodian, Claudia Thoermer, Susanne Kristen and Hannah Perst (University of Munich)

The symposium addresses the ontogenetic origins and development of human social cognition. The speakers present research pertaining to current debates about the presence and scope of 'theory-of-mind' in infancy, its usage and origins, and its developmental relations to later expressions of 'theory-of-mind' in childhood.

The first speaker, our host Ágnes Kovács, argues and presents evidence for an automatic computation of the contents of others' belief representations in both adults and infants of half a year of age. It is suggested that such computation is triggered automatically by the presence of a potential social agent. On a cognitive account the belief representations are stored in a format sufficiently similar to a participant's own beliefs to affect her behaviour, even when the representations are in conflict with her own representation of reality.

The second speaker, Charlie Lewis, re-examines the interpretation that infant looking patterns indeed reveal an innate understanding of the mind. The pattern of results from three variations of an infant habituation 'theory-of-mind' task suggests that a group of constituent skills unfolds gradually and at different times during the second year of life. The authors (with James Stack) provide a social-constructivist account which does not simply reflect an unfolding of an innate module. They argue that understanding human agency is the product of a group of social interactional skills involving intentional actions, shared experiences and shared attention.

The third speaker, Ulf Liszkowski, takes a usage-based perspective on social cognition. Recent experiments are reported which show that 1-year-olds use their social-cognitive understanding to communicate on a mental level when comprehending and producing non-verbal pointing gestures. Correlational and cross-cultural studies address the role of social

interaction in the ontogenetic emergence of these prelinguistic communication skills. It is suggested that 1-year-olds' social-cognitive understanding that underlies their prelinguistic communication is in part mediated by social interaction frames within which infants are immersed from their first year of life.

The fourth speaker, Beate Sodian, presents a longitudinal study from 7 to 48 months of age. The authors (with Claudia Thoermer, Susanne Kristen, Hannah Perst) investigate whether specific infant competencies are developmentally related to a later explicit understanding of others' mind. Findings pertain on the one hand to specific developmental pathways from an understanding of imperative and declarative communicative intent to later volition and cognition talk, and, on the other hand, to a relation of implicit and explicit false belief understanding independently of IQ. Findings are discussed with respect to claims about domain-specific conceptual continuity.

As a whole the symposium converges to reveal an early and sophisticated understanding of others' actions and mental representations in the second year of life. The speakers focus on different aspects of cognitive, social, and developmental mechanisms or influences that give rise to the emergence and development of an understanding of other persons. The contributions pertain to debates about modularity, constructivism, and developmental continuity.

Representational preconditions for understanding other minds

Ágnes Melinda Kovács
Central European University, Budapest

Successful social interactions and understanding the behavior of other agents requires computing others' internal states, such as goals, intentions and beliefs. Research in the last quarter of a century have suggested that such abilities arise relatively late in childhood and require effortful computations. However, there is a growing body of recent evidence suggesting that such abilities are present already in the second year of life. Here, we present a series of studies suggesting on the one hand that infants in their first year compute others' belief representations, and on the other hand they point to the extraordinary efficiency of the belief attribution system. The data suggests that this system is triggered automatically by the presence of a potential social agent, and that the agent's beliefs are stored in a format sufficiently similar to the participants' own beliefs to affect behaviour in adults and infants. In an implicit false-belief task, expectations about an object's presence modulate adults' detection latencies and infants' looking times, irrespective of whether the expectations are their own or attributed to the agent. Hence, adults and young infants seem to automatically compute the contents of others' belief representations, which can influence their behaviour even though these representations are in conflict with their own representations about the reality.

A developmental account of 'Infant False Belief' understanding

James Stack and Charlie Lewis
Lancaster University

Onishi and Baillargeon's (2005) 'infant false belief' experiment, and its many replications, show that infants look longer at someone's reach which violates that actor's knowledge of events. These studies seem to suggest that infants' grasp of others may emerge in the child's second year or even earlier. In this paper we re-examine the interpretation that infant looking patterns reveal an innate understanding of the mind. In a series of experiments involving 10-22 month olds, we analyze the component parts of the 'false belief' experimental procedure, exploring [a] infants' understanding of the role of intention; [b] the actor's commitment to placing an object in one of two hiding places; and [c] the role of shared attention in the task. Three variations on the task suggest that a group of constituent skills unfolds gradually and at different times during the second year, providing an account which does not simply reflect an unfolding of an innate module. We suggest that infants first grasp another's intentional actions but only within dyadic interactions. These skills slowly transfer to events that are not shared between interactants. We thus argue that understanding human agency is the product of a group of social interactional skills involving intentional actions, shared experiences and shared attention.

Prelinguistic communication and social cognition

Ulf Liszkowski
MPI, Nijmegen

I will first present several recent experiments which show that infants communicate on a mental level when comprehending and producing non-verbal pointing gestures. Following a usage-based approach to social cognition we find that infants do not only process ongoing actions in terms of the underlying intentionality, but also use their predictions about others' actions in order to intervene helpfully through communication when appropriate. I will then address the role of social interaction in the ontogenetic emergence of these prelinguistic communication skills. Correlation studies reveal an age-controlled relation between parental and infant pointing. Cross-cultural comparisons reveal that index-finger pointing is a universal developmental achievement. However, cross-cultural, natural but systematic observations reveal vast quantitative differences in infants' social-interactional experiences. These differences relate to the age of emergence and usage of infants' gestures. Following a usage-based approach it is suggested that 1-year-olds' social-cognitive understanding that underlies their prelinguistic communication is in part mediated by social interaction frames within which infants are immersed from their first year of life.

Developmental relations between an implicit and an explicit understanding of the mind: Findings from a longitudinal study

Beate Sodian, Claudia Thoermer, Susanne Kristen and Hannah Perst
University of Munich

An implicit understanding of the mind in infancy has been demonstrated in looking-time studies, as well as in social interaction. However, little research has addressed the question of whether specific infant competencies are in fact developmentally related to a later explicit understanding of the mind. In a longitudinal study of N=96 infants'
social cognitive development from the age of 7 to 48 months, we assessed social communicative competencies, as well as looking-time patterns in the first and second years of life in a variety of tasks. Measures of an explicit understanding of mental states include mental state vocabulary (at the ages of 24 and 36 months) and false belief understanding (at the age of 48 months). In the present paper, we will focus on two sets of findings: (1) Specific developmental pathways from an understanding of imperative and declarative communicative intent to later volition and cognition talk and (2) A relation of implicit and explicit false belief understanding independently of IQ. Findings willl be discussed with respect to claims about domain-specific conceptual continuity.

IS-003
DEVELOPMENTAL ORIGINS OF PROPERTY OWNERSHIP

Organizer

Ori Friedman (University of Waterloo)

Participants

Sarah Brosnan (Georgia State University)

Patricia Kanngiesser, Nathalia Gjersoe, Bruce M. Hood (School of Experimental Psychology, University of Bristol)

Philippe Rochat (Emory University)

Ori Friedman, Karen R. Neary (University of Waterloo)

Ownership of property is involved in countless daily activities, and is a major influence on behavior and thought. It constrains behavior in relation to objects—the owner of a bicycle is permitted to ride it, while non-owners are not. It affects social behavior and moral judgments—a person who steals the bicycle may be punished and scorned, and is unlikely to be trusted. And it influences the extent to which objects are valued—the bicycle's owner is likely to believe it is worth more money than will non-owners considering purchasing it. Although ownership is pervasive, its nature and origins are mysterious. Why should it be that non-owners require permission before using an object, such as the bicycle? Is ownership a cultural creation, an innately specified aspect of our psychology, a consequence of having a sense of self, or something else? Such questions, and ownership itself, have been largely neglected in psychology. The talks in this symposium take a myriad of theoretical approaches to understanding ownership, and also report research examining ownership in a variety of populations including Western children and adults, children from diverse cultures, and chimpanzees.

Concepts of property in non-human primates

Sarah F. Brosnan
Department of Psychology & Neuroscience Institute, Georgia State University

Individual property is a rarity in most species of nonhuman primates, most likely because their lifestyles are not conducive to the maintenance of property. Nonetheless, just because these species do not frequently maintain property does not mean that they lack the propensity to do so. Several recent experiments shed light on primates' concepts of

property. First, several primate species are known to show an endowment effect, similar to that in humans, preferring to maintain property that they have in their possession rather than trading it for other (presumably superior) items. Second, chimpanzees are quite good at barter, either between themselves and a human experimenter or between conspecifics, however they show little inclination to do so in risky or potentially costly situations.   In a recent study, subjects were trained to barter with each other, yet ceased doing so as soon as experimenter control was removed.   Property concepts beyond possession may be challenging for chimpanzees due to the risks involved when social and institutional controls for maintaining property (e.g. gossip or legal mechanisms) are lacking.   By comparing these data in other primates to that available in humans, we gain perspective on how human property concepts have evolved.

Children's and Adults' intuitions regarding the acquisition of property

Patricia Kanngiesser, Nathalia Gjersoe and Bruce M. Hood
School of Experimental Psychology, University of Bristol

Property ownership plays a crucial role in many of our every day social interactions, but how do people justify the acquisition of property in the first place? The philosopher John Locke suggested that people often come to own things by virtue of working upon them. Here we present a series of studies that investigate the influence of creative labour on ownership judgments in preschool children and adults. Our studies evaluated how people made ownership judgments when they were engaged in a craft-making scenario where materials were borrowed and new objects were created. Our findings indicate that participants were more likely to transfer ownership to the creator of an object when s/he had invested creative labour than when s/he had not. In addition, this effect was significantly stronger in preschool children than adults. Two additional studies revealed that ownership transfer in preschool children was not attributable to duration of manipulation and only secondarily to changes in the object's identity. Furthermore, ownership judgments in adults were reflected in their monetary judgments (i.e. dividing money between the creator and the original owner) and remained unaffected by the amount of creative freedom participants were given. Recent data on how children and adults evaluate the investment of creative labour in third-person scenarios supports our findings further. Overall, our results indicate the children and adults may indeed use the investment of (creative) labour as a heuristic to justify the acquisition of property. Moreover, determining property ownership may be an early emerging, intuitive process.

Possession and morality in young children across cultures

Philippe Rochat
Department of Psychology, Emory University

From the moment children say "mine!" by 2 years of age, objects of possession change progressively from being experienced as primarily un-alienable property (i.e., something that is absolute or non negotiable), to being alienable (i.e., something that is negotiable in reciprocal exchanges). As possession begins to be experienced as alienable (between 3 and 5 years), the child enters "moral space", a socially normative and evaluative space made of perceived values that are either good or less good, and where accountability and reputation begin to play a prominent role. My goal in this presentation is to emphasize the role of culture and the close developmental link between possession and morality.

Preschoolers value ownership more strongly than do adults

Ori Friedman and Karen R. Neary
University of Waterloo

People are permitted to use remarkably few of the many objects they encounter—they are typically barred from objects belonging to others. Respecting others' property requires setting aside self-interest and greed, and instead heeding ownership rules. Disputes over objects are common in young children. Hence, it is plausible that preschoolers' reasoning about ownership is limited, and that respect and appreciation for ownership rules develops in later years. Opposite to this, we argue that preschoolers value ownership rights more strongly than do older children and adults. Whereas adults and older children consider multiple factors (including ownership) in deciding who ought to use an object, young children uphold owners' rights to the exclusion of other factors. These findings challenge the intuitive view that children learn about ownership from adult input. We propose that children instead come to appreciate ownership by extending notions of personal rights. Rather than strengthening children's appreciation of ownership rights, adult input may serve to teach children about situations where it is socially appropriate to disregard ownership.

IS_004
COMPARATIVE ASPECTS OF SOCIAL COGNITION: CAVEATS AND PERSPECTIVES

Organizer

József Topál (MTA, PKI, Hungary)

Participants
Juliane Kaminsky (MPI Leipzig)
Shoji Itakura (Kyoto University, Department of Psychology)
Zsófia Viranyi (Vienna University, Wolf Science Center)

Discussant:Ádám Miklósi (Eötvös Loránd University, Department of Ethology, Budapest)

Comparative cognition lives through wonderful times. There is not only a growing interest on the part of the researchers of the field but biologists, psychologists and the like working in other disciplines are looking for understanding of the complex network of causal effects that may under lie what we know as cognition.

It is also beyond dispute that comparative cognition is a young science even when its roots go back to the beginning of the last century. The situation resembles the case when taxonomists in hundreds went out "hunting" for new plant and animal species. At present "highlights" of comparative cognition are when a new hitertho unknown skill is uncovered in one animal species. While it is important that such evidence is gathered, at the same time we need also to look at the broader picture how such knowledge can be systematised. Evolutionary theory is an obvious tool for starting to think about such issues but at some point we need to go deeper, and find a concept of behaviour that facilitate this comparative work, not just among two or three species but for a much wider circle. Comparative cognition has to grow up and face the challenges that will be provided by other rapidly expanding sciences like cognitive science and robotics.

Homology or Analogy: Both help to understand the evolution of human behaviour.

Juliane Kaminski
Max Planck Institute forEvolutionary Anthropology

Human social cognition seems to be unique. A very basic social cognitive skill is gaze following. From very early on infants begin to sense the gaze direction of others and follow others' gaze in order to seek information about their visual experiences as well as follow gaze communicatively. Gaze following in order to be able to see what others see, seems to be widespread in the animal kingdom. Primates and also other species have been observed to follow others' gaze to an outside entity. However, gaze following in primates, also presents us with a conundrum, because a slight alteration in the procedure leads to a significant drop in the subjects' performance. If a human experimenter tries to inform the subject through gaze about the location of hidden food from a number of potential targets, different animal species seem to ignore the experimenter's gaze and cannot find the hidden food. Non-human animals therefore seem to have difficulties in understanding the referential, communicative nature of gaze (or other social cues) in triadic situations. An interesting exception is the domestic dog, which seems to be exceptionally good in using human given communicative cues despite being not so good in following human gaze into open space.

In my talk I will present a theoretical framework, which may explain the seemingly contradicting data for the different species. The evidence available today also supports the necessity to compare different and more distantly related species in order to understand the evolutionary roots of human behaviour.

Development of social mind: Perspective from Developmental Cybernetics

Shoji Itakura
Kyoto University, Department of Psychology & ATR Intelligent Robotics and Communication Laboratories

I will propose the new idea of research domain called "Developmental Cybernetics" and introduce some of our studies. Developmental cybernetics is a study of interaction and integration between children and robots. Futurists and technologists have long predicted that the 21st century will see a wide application of robotics technology in common households where robots will be as ubiquitous as refrigerators and dishwashers. There are two purposes in Developmental Cybernetics. First is to investigate the development of

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social cognition or mentalizing in infants to employ nonhuman agents such as robots. Second is to construct nonhuman agents that are suitable for as human infants' environments. These should be on the cybernetics causality, on which both results give a feedback each other and progress. According to this point of view, I will reports our own studies, include perception of body movements, social contagion, response-bias, and learning from nonhuman agents.

Dog and wolf cognition: Lessons for and from the study of human cognition

Zsófia Virányi
Department of Cognitive Biology, University of Vienna, Vienna, Austria
Clever Dog Lab, Vienna, Austria, Wolf Science Center, Ernstbrunn, Austria

In parallel with traditional human and non-human primate comparisons, studying the behaviour of the domestic dog and its closest wild-living relative, the wolf provides a unique opportunity to learn about the evolutionary and developmental processes that shape human cognition as well as about the functions and mechanisms of social behaviours. Ample evidence suggests that dogs and humans, in spite of their phylogenetic distance, often show comparable performance at the behavioural level (e.g. selective imitation in adult dogs and in 14-month-old human infants). Human-like performance in dogs challenges cognitive sciences to come up with various hypotheses of the potential underlying mechanisms, and as such, strongly facilitates the development of psychological theory.

The evolutionary as well as developmental origins of human-like skills can be tracked by dog-wolf comparisons. Behaviour traits and skills found in humans and dogs but absent in wolves can be seen as the result of phenotypic convergence and are likely to reflect the operation of adaptive processes. These behaviours were most likely influenced by the domestication process during the course of which the dogs have been selected for cooperating and communicating with humans Longitudinal investigation of animals raised under controlled conditions can help us to detect the contribution of developmental and learning processes to the animals' performance. Such results of dog-wolf comparisons will be reported.

Dogs' receptivity to human social-communicative cues: "natural pedagogy" or "artificial peDOGogy"?

József Topál
Institute for Psychological Researches, Hungarian Academy of Sciences

Domestic dogs are often referred to as „artificial animals" possessing a wide variety of social-communication skills. A striking feature of these skills is that these often manifest in a sophisticated manner in inter-specific interactions (towards people) whilst dogs do not seem to utilize these skills at a high level in dog-dog interactions (e.g. use of eye contact in collaborative situations).

One aspect of the dogs' "human-centred" social competence is the functionally infant-analogue manifestations of „pedagogical receptivity" that has been originally described as human specific adaptation for cultural transmission of knowledge. It seems that the crucial components of the learning system called natural pedagogy can be found in both young infants and dogs; importantly however, there are crucial differences between them regarding the cognitive processes that enable infants and dogs for being the receptive party in a "teacher-learner" communicative interaction.

I will present comparative findings which raise the possibility that dogs may understand some aspects of human communicative motives, and, for the dog, the function of human demonstration is probably not knowledge transfer per se but facilitating the performance of those behaviour actions which lead to effective behavioural synchronization without necessarily comprehending the knowledge-transferring role of the "teacher" and/or the causal structure of the collaborative interaction. Such a disposition prepares dogs (as well as young infants) to efficiently learn from humans in a wide range of situations.

Regular Symposia

RS-001
SEARCHING THE TRUTH ABOUT FALSE BELIEF UNDERSTANDING

Organizer

Albert Newen & Leon de Bruin (Ruhr-Universität Bochum)

Participants

Josef Perner (University of Salzburg)

Victoria Southgate (University of London)

Albert Newen (Ruhr-Universität Bochum)

Leon de Bruin (Ruhr-Universität Bochum)

The explicit false belief task has traditionally been considered as a reliable indicator that children acquire an understanding of false belief around 4 years of age. In the explicit false belief task, children are asked to answer a direct question about an agent's false belief (e.g. Wimmer & Perner 1983, Baron-Cohen et al. 1985). Recently, however, empirical studies based on violation-of-expectation and anticipatory looking paradigms have claimed that implicit false belief understanding emerges at a considerably earlier age, in 25-month-olds (Southgate et al. 2007), 15-month-olds (Onishi & Baillargeon 2005), and even 13-month-olds (Surian et al. 2007).

Whether or not these findings are proof for an early understanding of false belief has been the subject of heated debate (Perner & Ruffman 2005, Csibra & Southgate 2006, Sirois & Jackson 2007). The issue is important because an onset of false belief understanding at 4 years suggests that Theory of Mind is the result of a cultural process and closely tied to language acquisition, whereas an onset at 13 months suggests that Theory of Mind is largely part of our biological inheritance.

The aim of this symposium is to bring together a number of renowned international scholars in order to propose and discuss possible interpretations of the results of implicit false belief studies and their implications for theories about Theory of Mind: two empirical researchers (Josef Perner & Victoria Southgate) with opposing views on the interpretation of implicit false belief tasks, and two philosophers (Albert Newen & Leon de Bruin) who discuss the importance of implicit false belief understanding in a wider philosophical framework. This promises to be a very interesting exchange.

Josef Perner observes that SR false belief tasks focus almost exclusively on the visual similarity of response patterns in their investigation of early Theory of Mind. Perner argues that SR false belief tasks have to test for conceptual similarity as well, in order to rule out the involvement of alternative inference systems (theories). In particular, we need to rule out explanations in terms of causally relevant features or 'smart encoding', and correct anticipatory responses based on 'behaviour rules'.

Victoria Southgate discusses evidence for the view that false belief understanding is already present during the second year of life. She presents two studies showing belief attribution in different contexts in 17- and 24-month-olds, and also a third study demonstrating that early success in belief attribution is not the result of employing behavioral rules, but rather reflects an understanding of the relationship between seeing and opaque mental states like beliefs.

Albert Newen puts forward the Person Model Theory (PMT) as a plausible way to integrate findings of both implicit and explicit false belief tasks. According to PMT, we rely on person models to understand others. These person models are either implicitly and intuitively used, as 'person schemata', or explicitly and inferentially, as 'person images'. Both varieties form the basis for the registration and evaluation of persons and their social behaviour, especially including a theoretical characterization of our understanding of false belief.

Leon de Bruin discusses the implications of the findings on implicit false belief understanding from a cross-cultural perspective. De Bruin argues that these findings shed new light on recent studies that have provided evidence for serious cross-cultural differences in explicit false belief, and proposes that whereas explicit false belief understanding might be culture-specific, implicit false belief understanding is probably universal and shared across all human cultures. He also discusses neurobiological evidence that might support this claim.

Theory of Mind and Levels of Understanding

Josef Perner
University of Salzburg

Language free tests of cognition for animals and human infants are based on demonstrating response patterns (e.g., looking time at test) over several stimulus conditions that would be expected if they employed the cognitive abilities under investigation (e.g., theory of mind). Alternative factors that could elicit the same pattern of responses are carefully excluded. However control of these alternatives focuses almost exclusively on visual similarity, e.g., that looking time depends on how similar the test stimulus is to earlier stimuli in the habituation or familiarisation phase. My argument is that we need to go further in our controls to also include conceptual similarity, and to rule out alternative inference systems (theories).

We need to control for similarity in terms of causally relevant features, e.g., that a person directs her gaze at an object being put into a particular location, because infants are more likely to encode these and ignore other constellations. Similarity based on such "smart" encoding can account for most data based on looking time (e.g. Onishi & Baillargeon 2005).

We also need to rule out correct anticipatory responses based on "behaviour rules" (Povinelli and Vonk 2004). And there is no good evolutionary argument why animals or infants would not employ such rules in addition to or instead of mentalistic rules. To decide the issue we need to go beyond demonstrations of what animals and infants can do in social situations but move to using cognitive measures that inform about the inference system (theory) that is being employed. Current studies do not provide any conclusive data.

Do infants really understand false beliefs?

Victoria Southgate
University of London

It has long been held that children below about 4 years of age do not understand that others can hold beliefs, and that these might differ from one's own. This consensus was based on the classic false belief task that requires children to answer questions about someone's likely actions. However, using an entirely different methodology, a now well-known study (Onishi & Baillargeon, 2005) suggested that belief understanding may be a much earlier achievement. This proposal has been met with a number of challenges and suggestions of alternative explanations that do not imply belief attribution.

In this talk, I will present data that supports the view that belief understanding is present during the second year of life. I will present 2 studies demonstrating belief attribution in different contexts in 17- and 24-month-olds. I will also present a third study demonstrating that early success in belief attribution is not the result of employing behavioual rules, but rather reflects an understanding of the relationship between seeing and opaque mental states like beliefs.

The Person Model Theory and False Belief Understanding

Albert Newen
Ruhr-Universität Bochum

The Person Model Theory (PMT) is presented as a plausible way to integrate the findings of both implicit and explicit false belief tasks. According to PMT, we rely on person models to understand others. These person models form the basis for the registration and evaluation of persons, their social behaviour and other relevant properties. It also grounds our understanding of false belief. We develop person models for ourselves, for other

individuals and for groups of persons (group models). All types of person models are realized on two levels: person schemata and person images. A person schema is a bundle of information including information about sensory-motor abilities, voice, face and basic mental dispositions etc. and such a schema functions without awareness and is realized by (relatively) modular information processes. A person image is a system of consciously registered mental and physical dispositions as well as situational experiences (like perceptions, emotions, attitudes, etc.). The development of abilities that enable false belief understanding is crucial for the development of person images.

Is Implicit False belief Understanding Universal?

Leon de Bruin
Ruhr-Universität Bochum

Recent studies on explicit false belief understanding cast doubt on the universality of explicit false belief understanding because they reveal considerable cross-cultural differences in Theory of Mind development and acquisition in children of collectivistic cultures compared to individualistic cultures (e.g. Chen & Lin 1994, Koyasu 1997, Naito & Koyama 2006, Liu et al. 2008). De Bruin argues that this should not surprise us if we consider that a full-fledged Theoy of Mind is a relatively recent product of human evolution (Byrne & Whiten 1997, Dunbar 1992). The capacity for implicit false belief understanding, by contrast, probably has deeper phylogenetic roots and is thus more likely to be universally shared amongst humans (and other primates). An important question is whether the cross-cultural differences in performance on explicit false belief tasks are also indicative for variability at the neurobiological level. De Bruin reviews a number of recent experiments that have found evidence for both universal and culture-specific correlates of Theory of Mind (e.g., Kobayashi et al. 2009), and discusses this in relation to explicit and implicit forms of false belief understanding.

RS-002
THE ROLE OF PROSODY IN GUIDING LANGUAGE LEARNING IN PRE-LEXICAL INFANTS

Organizer

Mohinish Shukla (University of Rochester)

Participants

Constantine Lignos and Charles Yang (University of Pennsylvania)

Casey Lew-Williams, Bruna Pelucchi and Jenny Saffran (University of Wisconsin-Madison)

Mohinish Shukla[1], Katherine S. White[2] and Richard N. Aslin[1] ([1]University of Rochester, [2]University of Waterloo)

Judit Gervain[1] and Janet Werker[2] ([1]CNRS-Universite Paris Descartes, [2]University of British Columbia)

The infant language learner faces a seemingly daunting task in acquiring almost all aspects of its native language from ambient speech (or signs). The physical input contains information about the lexicon and the grammar, and varies with pragmatic, semantic and personal idiosyncratic vagaries of individual speakers. To understand the rapidity of language acquisition by infants, it is thus necessary to understand how they represent their primary linguistic input. Over the last 15 years, there has been an explosion of research aimed at examining how infants deal with speech by stripping away different sources of variation in small, well-controlled artificial languages. For example, by idealizing speech as a sequence of syllables, it has been demonstrated that pre-linguistic infants can track the statistical properties of syllables and their combinations, and potentially use these for segmenting fluent speech (Saffran, Aslin & Newport, 1996, amongst many others).

However, speech is more than a sequence of syllables – it is organized in a hierarchy of prosodic domains, and the prosodic organization of language intersects with other aspects of language. For example, individual words often have languagespecific prosodic patterns, the words themselves are aligned with edges of phrasal prosodic domains, and the relative prominence of words within prosodic phrases is governed by the underlying word order of the language (e.g., Nespor & Vogel, 1986/2008, Christophe et al, 1997, Nespor et al 2008). This symposium illustrates how researchers have begun to approximate the complexity of infants' language input by considering the impact of prosody in segmenting speech. At the level of lexical prosody, Lignos & Yang provide a computational model that attempts to more closely model how infants might use the Unique Stress Constraint (e.g., Yang, 2004) as a cue to word boundaries. Lew- Williams, Pelucchi & Saffran and Shukla, White & Aslin also consider the problem of word segmentation, but they examine phrasal prosodic cues.

Lew- Williams et al show that presenting 9-month-olds with words as single utterances boosts recognition of these words in fluent speech and facilitates infants' detection of the words' statistical properties. Shukla et al pit intonational phrase (IP) prosody against statistical cues in a word mapping task and show that 6-month-olds treat statistically cohesive bisyllables as potential referring words only when they are prosodically well-formed, i.e., aligned with an Intonational Phrase boundary. Finally, Gervain & Werker move beyond segmentation of single words, and ask how bilingual 7-month-olds, exposed to languages with different word orders (OV and VO), deal with competing statistical (frequency) and prosodic (phrasal prominence) cues to word order, and find that prosody dictates the direction of segmentation.

With its potential to inform the lexicon, grammar, and even the pragmatic aspects of language, prosody is a rich source of information for the language learner. Together, the various presentations highlight how prosody at different levels can lead to sophisticated analyses of the speech input by pre-linguistic infants.

Using Prosody to Bootstrap Word Segmentation in a More Realistic Learning Environment

Constantine Lignos and Charles Yang
Computer and Information Science and Linguistics, University of Pennsylvania, Philadelphia, USA

Recent computational models of word segmentation have focused on distributional information and do not reflect experimental work focusing on infants' use of prosodic information (e.g., Johnson & Jusczyk, 2001). Yang (2004) and Gambell & Yang (2006) provide the first cognitively-oriented model that uses stress information, but their algorithm relies on two problematic assumptions: perfect lexical stress information and perfect retrieval of previously segmented words.

We present a new algebraic learner that segments in an online, left-to-right fashion, using stress information and a learned lexicon. We evaluate it across four conditions using a syllabified phonemic adaptation of the child-directed speech of the Brown (1973) corpus from CHILDES. In the Dictionary Stress conditions, each word has the stress given by CMUdict (Weide, 1998), while in the Reduced Stress conditions, adjacent stresses are adjusted to reflect natural speech (Selkirk, 1984). In the Perfect Memory conditions a word can be recalled even if hypothesized only once, while in the Probabilistic Memory conditions the probability of recall increases each time it is hypothesized.

The results show that using either more realistic memory or stress information alone has little impact on performance, but in combination performance degrades since words are both harder to identify and recall. Allowing the learner to iterate over the corpus, simulating greater language exposure, yields higher performance. Thus, while learning is slowed in more realistic conditions, eventual performance is similar. These results demonstrate that a

simple bootstrapping approach to word segmentation that uses prosodic information like infants can succeed in realistic scenarios.

Isolated Words Enhance Statistical Learning By 9-Month-Old Infants

Casey Lew-Williams, Bruna Pelucchi and Jenny Saffran
Department of Psychology, University of Wisconsin-Madison, USA

When exposed to continuous speech with no pause-defined or prosody-defined cues to word boundaries, infants find words by noting which syllables occur together consistently. But caregivers sometimes utter words in isolation, often repeated from an adjacent sentence (See the doggie over there? Doggie!), offering clear-cut data to infants about the prosodic organization and statistical coherence of syllables in longer sentences. Hearing an isolated word as its own intonational phrase provides a fairly unambiguous cue for word segmentation. Do isolated words offer a shortcut for segmentation, such that infants do not need to track transitional probabilities in natural speech? Alternatively, perhaps the presence of isolated words facilitates the detection of TPs in fluent speech.
We tested English-learning infants' abilities to track high- and low-TP words in natural Italian speech that either did or did not contain isolated words. In the Continuous Speech condition, infants (n=20) heard 2 high-TP words (TP=1.0) and 2 low-TP words (TP=0.33) 12 times each. In the Continuous Speech + Isolated Words condition, infants (n=20) heard the same words 6 times within sentences plus 3 times in isolation between sentences. Listening times showed that only infants in the latter condition differentiated between high- and low-TP words, suggesting that isolated words and longer utterances acted in concert to facilitate segmentation. Infants integrated information gained from hearing prosodically and statistically packaged units with the statistical cues to word boundaries available in fluent speech. This investigation brings research on statistical learning closer to the natural variation observed in infant-directed speech.

Prosody Guides Statistical Speech Segmentation And Word Learning In 6- Month-Olds

Mohinish Shukla[1], Katherine S. White[2] and Richard N. Aslin[1]
[1] Brain and Cognitive Sciences, University of Rochester, Rochester, NY, USA
[2] Dept of Psychology, University of Waterloo, Waterloo, ON, Canada

Several researchers have demonstrated that infants and adults can use co-occurrence statistics, e.g. the transitional probability (TP) between syllables, to segment continuous speech and extract statistically coherent (high-TP) sequences as potential words (e.g., Saffran, Aslin & Newport, 1996; Graf Estes et al, 2007). However, words are more than just highly frequent syllable combinations; for example, they are aligned with phrasal prosodic boundaries, which provide additional cues to word edges. While several studies have

established that infants are sensitive to phrasal prosody, few have investigated the interaction of such prosodic cues with statistical cues to segmenting speech.

In this study, we exposed 6-month-old infants to bisyllabic, high-TP nonce words that were either aligned or misaligned (across infants) with intonational phrase (IP) boundaries. In a novel contingent eye-tracking paradigm, infants saw one of two target objects move, while hearing associated two-IP "sentences" containing the nonce word. In a subsequent test phase, we assessed changes in infants' looking behavior when they heard novel tokens of the nonce words, as isolated utterances. Infants who were exposed to words aligned with an IP boundary increased their looking to the target object and decreased their looking to the distractor. However, infants exposed to the words straddling an IP boundary showed the opposite pattern: increased looks to the distractor and decreased looks to the target.

These results demonstrate that infants can acquire word-object mappings by 6 months of age, and that this process is both facilitated and constrained by prosody.

Learning Two Grammars Through Prosody: 7-month-old Bilingual's Acquisition of the Word Order of their Native Language

Judit Gervain[1] and Janet Werker[2]
[1] LPP, CNRS-Universite Paris Descartes, Paris, France
[2] Department of Psychology, University of British Columbia, Vancouver, Canada

We ask how 7-month-old bilinguals learn the word orders of their languages when these are in conflict: Verb-Object (VO) order in one language (English), OV order in the other (Japanese, Farsi, Korean, Hindi, Punjabi or Turkish). Frequency and prosody correlate with word order. In OV languages, frequent words, i.e. grammatical functors, appear in phrase final positions, whereas in VO languages, they occupy initial positions. Infants can use frequency to parse word order (Gervain et al, 2008). Similarly, while OV languages show prominence-initial prosody, realized as increased pitch/intensity, VO languages have prominence-final phrases implemented as increased duration (Nespor et al., 2008).

We created an artificial grammar using these cues. It comprised an alternating sequence of frequent and infrequent syllables, mimicking functors and content words, respectively. This way, the basic unit could be parsed as frequent-initial or frequentfinal. For half of the participants, the stream was synthesized using OV prosody (increased pitch on infrequent syllables), whereas for the other half, we used VO prosody (longer duration on infrequent syllables). We conducted a headturn preference study. After familiarization with the stream, infants were tested on frequent-initial (VO) and frequent-final (OV) test items (no prosody). Infants in the VO condition looked significantly longer at the VO items, while infants in the OV condition looked significantly longer at the OV items. To further explore prosody as a cue, we conducted measurements of phrasal prosody in the infants' languages of exposure. Our results suggest an important role for prosody in bilingual grammar learning.

RS-003
ON THE EARLY DEVELOPMENT OF MEMORY SUBSYSTEMS

Organizer

Ildikó Király (Eötvös Loránd University, Budapest)

Participant

Zsuzsa Káldy and Erik Blaser (University of Massachusetts Boston)

Gabriella Óturai, Thorsten Kolling, Laura Rubio Hall, Florian Remmers and Monika Knopf (Goethe University Frankfurt)

Ildikó Király and Erna Halász (Eötvös Loránd University, Budapest)

Claudia Goertz[1], Bettina Lamm[2], Sonja Borchert[1], Frauke Graf[1], Thorsten Kolling[1], Heidi Keller[2] & Monika Knopf[1] ([1]Goethe University, Frankfurt, [2]University of Osnabrück)

Memory development is one of the most widely studied fields of cognitive development, yet there are several open questions on the interrelatedness of the different memory subsystems and their developmental time courses. It is important to keep in mind that previous research has shown that whereas some memory systems develop with age, others do not. While little developmental change was observed in recognition memory (Rovee-Collier, 1997) or implicit memory (Bullock et al., 1995), significant developmental changes were found to occur in explicit memory (Bauer, 2006) and working memory (Henry & Millar, 1993).

The aim of this symposium is to bring together new approaches in the field that aims to explain some of the changes in memory subsystems. Our hope is that some of these findings may in turn have implications for the development of other cognitive systems, and can serve as starting points for further studies on the underlying mechanisms of transitions. The four contributors explore different aspects of human memory from the above introduced developmental perspective.

Paper 1 reports an innovative new study on 6-month-old infants' iconic memory capacity, thus introduces a new topic to the field. This paper highlights that a stable iconic memory system is already available for infants as a primary visual interface and serves as a short-term store from which critical information can be selectively rescued.

Paper 2 describes an eye-tracking paradigm with 12- and 18-month-old infants that tested whether functionally relevant vs. irrelevant action parts already differ on a perceptional-attentional level during encoding. This study aims to capture whether selection of long term

memory content in a deferred imitation paradigm is influenced by selective attention or more elaborated organizational factors.

Paper 3 investigates whether 2- to 3-year-olds are able to encode and retrieve specific information in a deferred imitation task with the help of narrative cueing in the presentation context. Thus this study tries to show the role of social contextual cueing in the emergence of episodic memory.

Paper 4 presents deferred imitation in a new, cross-cultural perspective. In this study both German middle-class infants and Cameroonian Nso farmer infants participated in age-adapted deferred imitation tasks at 6, 9 and 18 months of age. Results are discussed in respect of the universal validity of deferred imitation as a measure of declarative memory, as well as of cultural theories of early development.

In conclusion, this symposium brings together different subfields of memory development with innovative paradigms and exciting results. It aims to facilitate integrative discussions and further explorations of blind spots in this fascinating domain of developmental research.

The first buffer of visual information: Iconic memory in infants

Zsuzsa Kaldy and Erik Blaser
University of Massachusetts Boston

The study of both visual perception and visual short-term memory (VSTM) in young infants have long, and for the most part, parallel histories (see e.g. Gesell, 1950, Fantz, 1963; Hunter, 1917, Fagan, 1970). For instance, we know that infants have sufficiently well-developed visual acuity to distinguish dozens of objects in a single fixation (Teller, 1997) at 6 months of age. On the other hand, infants' VSTM capacity have been found to be limited to a single object at this age (see Ross-Sheehy, Oakes, & Luck, 2003, Pelphrey et al., 2004, Kaldy & Leslie, 2005). But how is this one object chosen from among the dozens? We argue that iconic memory is the buffer holding the choices. Iconic memory - the visual system's first, fleeting snapshot of visual information that provides the link between the perceived world and longer-term memory - while established 50 years ago in adults, has never before been tested in infants. We adapted the classic partial report paradigm (Sperling, 1960) to make it suitable to young infants and found that 6-month-olds' iconic memory capacity approached 5 items. Adults tested in the same exact paradigm (who received verbal instructions) showed a 6-item capacity limit. This apparently rapid development of this mechanism strikes us as adaptive. Just as for adults, infants' iconic memory is an essential faculty to a visual system faced with too much information and limited resources: a high-capacity, but short-lived store from which critical information is selectively rescued.

Selective imitation in a deferred imitation paradigm – Can eye-tracking provide a deeper understanding?

Gabriella Óturai, Thorsten Kolling, Laura Rubio Hall, Florian Remmers and Monika Knopf
Goethe University Frankfurt am Main, Germany

Infant imitation research is conducted in two rather separated areas: Immediate imitation (II) studies, focusing on action understanding, have demonstrated that infants do not blindly copy actions, but tend to imitate relevant action parts and to ignore irrelevant ones – a phenomenon referred to as selective imitation. Deferred imitation (DI), in contrast, is used to assess declarative memory. DI-studies have shown that infants are able to recall a number of observed target actions after a delay and that their imitation performance increases with age. By combining these two research traditions, previous work (Óturai, Kolling, Rubio Hall & Knopf, submitted) showed that DI-performance is moderated by the functional relevance of target actions with relevant actions being imitated more frequently and retained longer than irrelevant ones. It remained unclear, however, whether this effect was due to decreased attention to irrelevant actions during demonstration or was driven by selective imitation processes. The present DI-study therefore analyzed the looking behavior of 12- and 18-month-olds during the demonstration of target actions with a remote eye-tracker. The results indicate that selective deferred imitation cannot be explained by differences in attention to relevant vs. irrelevant actions pointing to cognitive extraction processes guiding imitative behavior. Besides a correlative analysis of behavioral and eye tracking data, the pros and cons of eye tracking in imitation paradigms will be discussed critically.

The emergence of specific event memories: the role of narratives in encoding

Ildikó Király and Erna Halász
Eötvös Loránd University, Budapest, Hungary

There is ample evidence supporting that long term recall emerges well before the verbal ability to describe past experiences; long term recall processes become reliable over the 2nd year in human infants (Bauer et al, 2000). Still there is a debate on how to conceive the retrieval performance attained by imitation: it is 'remembering' (representing a past event as a unique past event) or it is 'recall based on knowledge' (representing an event - that happened in the past) (see Perner et al, 2007). There are several candidate theories that try to explain the transition between the above mentioned forms of memory during development, while the most influential one argues that linguistic socialization plays a crucial role in this process (Nelson and Fivush, 2004)

The main objective of our study was to test the possible role of linguistic context in encoding and thus retrieving specific information with the means of deferred imitation. It was supposed that narrative cues not just helped to encode more information but also entailed the embedding of distinctive features into the relevant string of event information. Children between the age of 28 and 36 months were tested with an 8-step cooperative task. It was revealed that children tended to recall more information following a modeling in full narrative context in contrast to a modeling with empty narrative. Furthermore, the advantage of the full narrative encoding context was captured in the more elaborate re-enactment of the distinctive, specific features of the modeled event.

Memory development in infancy from a cross-cultural perspective: Deferred imitation in 6-, 9-, and 18-month-old German and Cameroonian Nso infants

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Deferred imitation (DI) is well accepted as a method to assess declarative memory in preverbal infants. Until now, mostly Western middle-class infants were tested with this paradigm. Whereas evidence has been presented that imitation as a universal learning principle is found in various cultures, early cultural differences in DI behavior and/or declarative memory performance are largely unknown. The first study investigated DI performance in two samples from two cultural contexts: Cameroonian Nso farmer infants and German middle-class infants were tested at the age of 6 and 9 months with a pillow task, similar to the hand puppet task (Barr, Dowden, & Hayne, 1996). Infants' imitative behavior was observed and compared with baseline behavior. Both the Cameroonian Nso and the German infants showed significantly more target actions in the test than in the baseline phase (memory effect). Whereas at the age of 6 months no cultural differences in memory performance were observed, Cameroonian infants showed fewer imitations at 9 months than the German sample. The second study at the age of 18 months using the deferred imitation test FIT 18 (Goertz et al. 2008) revealed that these differences increase with age. These results clearly demonstrate that memory performance can be assessed with DI in infancy in various cultures. Cultural influences on the memory-based performance occurred from the second half of the first year and increased with age. Results will be discussed in consideration of cultural theories of early development (Keller, 2007).

RS-004
PROBING THE YOUNGEST BRAINS: EXPLORING NEWBORNS' AND YOUNG INFANTS' PERCEPTUAL ABILITIES USING NIRS

Organizer

Judit Gervain (CNRS-Université Paris Descartes)

Paricipants

Lilian May[1], Krista Byers-Heinlein[2], Judit Gervain[3] and Janet Werker[1] ([1]University of British Columbia, [2]Concordia University, [3]CNRS-Universite Paris Descartes)
Judit Gervain[1], Inga Vendelin[2] and Emmanuel Dupoux[2] ([1]CNRS-Universite Paris Descartes, [2]CNRS-ENS-EHESS)
Sarah Lloyd-Fox (Birkbeck, University of London)
Silvia Benavides-Varela[1], David M. Gomez[1], Francesco Macagno[2]and Jacques Mehler[1] ([1]SISSA, Trieste and [2]Saint Maria della Misericordia Hospital, Udine)

Near-infrared spectroscopy (NIRS) is a new and increasingly popular brain imaging technique, particularly suitable for infants. Beyond its practical advantages (ease of application, movement tolerance), NIRS has already made significant empirical contributions to our understanding of cognitive and neural development in infancy. It has allowed us to explore the origins of the left lateralization of language processing at birth (Peña et al., 2003; Gervain et al., 2008) as well as during the process of perceptual attunement to the native language (Minagawa-Kawai et al., 2007). In the domain of social cognition, the development of face perception has been documented and its neural correlates have been identified (Blasi et al., 2007; Otsuka et al., 2007). Preferential responses to dynamic social cues (e.g. eye movement) have also been found (Lloyd-Fox et al., 2009). Nevertheless, many early cognitive abilities and underlying brain specializations remain unexplored.

The present symposium has the double objective of tracing the developmental origins of some core abilities in speech perception and social cognition using NIRS, as well as bringing together leading NIRS experts for a discussion of issues regarding the interpretation of NIRS data. The presentations explore a broad range of basic perceptual abilities at different age ranges using different NIRS systems and data analysis techniques, stimulating an in-depth and integrative discussion of theoretical and methodological questions concerning brain development and its assessment through NIRS.

One area where NIRS has proven particularly useful is newborn testing. This is a population for which NIRS presents numerous advantages over existing behavioral and imaging techniques (lower attrition rates, better spatial resolution etc.). The use of NIRS in this population is illustrated by Presentations 1 (May et al.), 2 (Gervain & Dupoux) and 3

(Benavides et al.), investigating different aspects of speech perception at birth. Specifically, May et al. ask whether the left lateralization of speech processing applies only to the native language (i.e. the one heard in utero), which is what previous studies used (Pena et al., 2003), or whether it is a general brain specialization for the processing of language, familiar and unknown alike. Gervain & Dupoux examine the presence of auditory grouping biases as birth. It is currently debated whether the prosodic and rhythmic grouping of sounds contrasting in intensity or duration is an automatic auditory principle independent of language (Hayes, 1995; Hay & Diehl, 2007) or whether it arises as a result of language experience (Iversen et al., 2008). By testing newborns's performance, Gervain & Dupoux seek to determine whether the grouping bias is operational without considerable language experience. Benavides et al. investigate newborns' memory for spoken words, testing under what circumstances words vs. non-linguistic sounds are retained in memory.

NIRS has also been productively used for the imaging of older infants. Presentation 4 (Lloyd-Fox) investigates early functional brain specializations for auditory and visual social cues in four-to-seven-month-old infants combining NIRS with fMRI. Healthy infants as well as infants at risk for autism are tested and the brain circuits activated by the social stimuli in the two groups are compared.

The left lateralization of language at birth: the native vs. a non-native language

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Previous research has shown that newborn infants demonstrate a left hemisphere cortical bias when processing native language versus acoustically similar non-linguistic stimuli (Pena et al., 2003). In the current study, we use optical topography to examine whether this left-hemisphere bias for language in neonates has its basis in an innate preparedness for language in general, or if it is instead driven by pre-natal language experience. Twelve English-exposed neonates aged 0-3 days were tested, and neural activation to both native and non-native language in contrast to non-linguistic backwards speech was measured. Each infant listened to blocks of low-pass filtered native language (English) and non-native language (Tagalog), as well as to backwards low-pass filtered English and Tagalog.

Preliminary results illustrate greater activation in the left hemisphere to forward versus backward native language (English), replicating past results. In contrast, neonate neural responses to non-native speech show a markedly different pattern. For the non-native language response, we find a strong inverted response (marked by a decrease in oxygenated hemoglobin and an increase in deoxy) to forward and backward Tagalog

speech across both hemispheres. Furthermore, results do not indicate a left-hemisphere advantage for forward versus backward non-native language similar to that found in response to native language.

Results from the current study therefore indicate that the newborn brain does not respond in the same manner to familiar versus unfamiliar language. In addition, our findings suggest that left hemisphere specialization for language in neonates is likely to be at least in part rooted in language experience.

Tick-tock and bim-bom: the origins of prosodic and rhythmic grouping

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It has long been recognized (Woodrow, 1909; Hayes, 1995) that we tend to perceive a sequence of sounds that contrast in duration as prominence-final (short-long; an iamb), whereas we group a sequence of sounds contrasting in intensity or pitch as prominence-initial (strong-weak/high-low; a trochee). Whether this grouping bias, known as the Iambic-Trochaic Law (ITL), is an automatic perceptual principle independent of language (Hayes, 1995; Hay and Diehl, 2007) or whether it is the result of exposure to the rhythm and prosody of the native language (Iversen et al., 2008; Yoshida et al., 2009) is currently under debate. This question is also relevant for language acquisition, as the rhythmic and prosodic groups found in speech are at least partly aligned with underlying syntactic structures and can thus serve as cues to grammar, if infants are sensitive to them.

To investigate the developmental origin of this bias, we presented 3-day-old newborns with pure tone sequences that either obeyed the ITL (short-long in the duration condition, high-low in the pitch condition), or violated it (long-short or low-high), or they were neutral, presenting no contrast (long-long, high-high). Newborns' brain activity was measured using NIRS. Preliminary results for the durational contrast condition indicate that newborns show an increase in oxyHb concentrations in the temporal areas of the LH in response to the sequences consistent with the ITL (iambic: short-long), but not for the other two types of sequences. These results imply that rhythmically and prosodically canonical sequences are processed preferentially by the neonate brain.

Imaging the developing infant social brain using fNIRS and fMRI

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How specialized is the infant brain for perceiving different forms of social cues in our environment? The human face and voice contain crucial social cues for communicating intentions, thoughts and emotions. New advances in neuroimaging techniques allow the opportunity to study the early development of the cortex and investigate whether this functional specialization exists from an early age. By combining the advantages of two neuroimaging techniques (fMRI and fNIRS) we study cortical responses to visual and auditory social cues during two studies. Thirty-one 4-7-month-old infants participated. The fMRI study investigated functional specialization for non-speech human vocalizations that are emotionally positive (laughter), negative (cry) or neutral (coughing), in addition to non-vocal environmental sounds (toys and water). The fNIRS study measured cortical activation to social dynamic stimuli (peek-a-boo) and to the auditory stimuli used in the fMRI study. The findings indicate defined regions of the cortex that activate in response to both visual and auditory social cues, in the inferior frontal, lateral and superior temporal regions. Moreover, differences arise in the cortical activation to the non-speech vocalizations (peek-a-boo) videos and environmental sounds. The findings provide evidence for the early specialization of the cortex, suggesting cortical sensitivity to certain social cues from an early age. The research also highlights the potential these technologies offer for advancing our understanding of the developing brain. The project has now been extended to the study of infant siblings of children with autism. Preliminary data from this population will be briefly discussed in the concluding remarks.

Consolidation and forgetting in the neonate brain

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In the past, basic perceptual and cognitive abilities in neonates were predominantly studied using habituation-dishabituation paradigms. Those studies uncovered many of the newborns' sophisticated perceptual abilities to cope with linguistic stimuli (Juszcyk, 1997). However, the ability of neonates to represent and store auditory information remained almost unexplored, probably due to methodological limitations.
In previous studies, we have shown using fNIRS that newborns can memorize a word during a short familiarization phase (6min) and recognize it after a brief silent retention

interval (2min). They also recognize that word when a short part of the silent interval is occupied by a lullaby, but they forget it when another word is presented during the same period, due to interference.

Here we report preliminary fNIRS studies in which we explore the newborn's capacity to consolidate non-speech sounds in different contexts. These studies use modified versions of the original paradigm. During familiarization, newborns hear 10 repetitions of the sound. In the test phase, half of the neonates hear the same sound, whereas the other half hears a different sound. We manipulate the consolidation process by incorporating sounds of varying nature at different moments of the retention interval. These manipulations allow us to uncover whether the interference effects previously found are the result of a specialization of the newborn's brain for speech or whether interference and other memory processes are also manifested in the processing of non-linguistic sounds.

POSTER SESSION A

A-001

Inductive reasoning about living kinds improves through experience with animals

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It remains in question whether category induction is an early bias (Gelman & Markman, 1986), or whether young children initially focus on perceptual information and begin to use category-based induction through experience (Sloutsky, Kloos & Fisher, 2007). This study investigated the effect of domain-specific experience on children's induction strategy preference. Children aged 5-7 years (N = 252) participated in four inductive reasoning tasks. The experimental condition (N = 129) also took part in an interactive educational session with real animals, and learnt about environments and adaptations. Every child completed two tasks a week before, and a week after the educational session. Children were taught to categorise the kinds, then required to generalise a hidden property from a target item (e.g. an adult tree frog) onto either a perceptual distractor (e.g. an adult common frog) or a category choice (e.g. an infant tree frog). A shift from perceptual to category preference was observed with age $F (1, 227) = 15.65$; $p < .001$, and an interaction was found between session and condition $F (1, 227) = 7.10$; $p = .008$, showing a greater increase in category choices for the experimental group after the educational experience. The shift shows an early category bias to be unlikely. The greater improvement for the experimental condition suggests that category preference develops through direct experience and domain knowledge.

A-002

Parental Gesture As a Cue to Generic vs. Particular Reference

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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.

A-003
Generic Noun Phrases and Preschoolers' Memory for Different Levels of Categories

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An important task of childhood is flexibly classifying the same object into multiple categories. This is especially important in the social domain, where the same individual can be classified by gender, age, race, etc. We propose that language plays a crucial role in directing one's attention to different levels of categories. That is, for specific sentences, the label serves to pick out the relevant instance, such that the particular label used doesn't change the interpretation (e.g., "This boy is thirsty" is equivalent to "This child is thirsty"). For generics, the conceptual information in the label is important in conveying scope (e.g., "Boys like chocolate" is not equivalent to "Children like chocolate"). Preschoolers (N=13, M=4.54) and adults (N=18) were presented with pictures and accompanying sentences. The study included the animal domain, where individuals fit within hierarchies (beagle, dog, animal), and the social domain, where individuals belong to overlapping categories (boy, child, American). Half the labels each participant heard were basic level ("dog"); half were non-basic ("animal"). If children are sensitive to the differing role of labels, they should show better recall of the label level in the generic than specific sentences. Initial analyses show that adults more accurately recalled the labels presented in generic vs. specific

sentences, although this effect appeared only for the social domain. Children, however, did not show greater accuracy for generic sentences. Instead, they showed a bias to distort information they hear as referring to basic-level categories, even when that information is presented in generic form.

A-004
More than meets the eye: how category structure affects infants' word learning

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Infants learn words amazingly quickly. When presented with one novel and several known objects, infants can quickly link a novel name to the novel object. Recent research demonstrates that infants learn this fast-mapped label after exposure to multiple category exemplars, but do not learn after exposure to a single exemplar (Horst and Ranson, under review). However, what infants learn when category structure varies remains unclear. To address this, we tested exemplar versus category learning after exposing 2-year-old infants to categories of novel objects via 18 fast-mapping trials. Half the infants encountered narrow categories (e.g., three perceptually-similar kazoos), and half encountered variable categories (e.g., three perceptually-variable kazoos). Further, categories were either presented in blocked (consecutive) or mixed (randomised) order. After a 5-minute delay, infants received both exemplar test trials (mapping novel names to previously-seen category exemplars), and category test trials (extending the same names to new category exemplars). All infants performed above chance (.33) during fast-mapping (all ps <.05). However, only infants in the narrow-blocked condition learned names for individual exemplars (p<.001) and only infants in the variable-blocked condition learned names for categories (p<.05). Infants in the two mixed conditions did not learn names for individual exemplars or categories. Thus, infants learned different things depending on the variability of the category they encountered. Overall, these data suggest that category variability dramatically influences infant word learning and thus have implications for broader understanding of attentional and cognitive development more generally.

A-005
The Role of Emotions in Children's Evaluations of Ownership Transfers

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In situations dealing with ownership transgressions, the presence of harm may be difficult to detect, preventing young children from engaging in social and moral evaluation of the agents involved. Here, we explore, using non-verbal stimuli, whether young children's moral evaluation of an agent involved in a property transfer is modulated by the affect displayed by the owner during the interaction. 3-year-old children, and adults as a control group, were presented with two non-verbal animated cartoons of social interactions. They watched one character acquiring an object by gift-reception (legitimate condition) and another by theft (illegitimate condition). In each condition, the transfer was immediately followed by either (between subjects) the same negative emotion (sadness) of the 1st possessor of the object (emotional condition) or no reaction (non-emotional condition). The results showed that 3-year-olds preferred the legitimate recipient as opposed to the illegitimate one only in the emotional condition, whereas adults did so in both the emotional and the non-emotional conditions. Children, as young as 3-year-olds, did show evaluation of ownership transfers in the presence of a negative emotion. Importantly, the emotion displayed was the same whether the behavior was legitimate or not. Therefore emotion alone cannot have acted as a cue to differentiate between the legitimate and illegitimate agents. Rather, we hypothesized that negative affect acts as a cue to the presence of (expected) harm, triggering social and moral evaluation. With an emotional cue, 3-year-olds blamed the agent more if his action was recognized as harmful.

A-006
Early pointing serves an interrogative function

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The motives behind infants' pointing behavior are classically described as either imperative, involving a desire to obtain a referent; or declarative, motivated by a desire to share attention or interest with others. However, a largely untested but alternative hypothesis, that infant pointing may function as requests for information about a referent (Southgate, van Maanen & Csibra, 2007), may be more consistent with data showing that adults typically respond to infants' pointing with information (Leung & Rheingold, 1981).

The current study aimed to test the hypothesis that infant pointing is interrogative by varying the perceived reliability of the experimenter with which infants were interacting. Based on findings that infants detect adults' reliability, and guide their behavior accordingly (e.g. Koenig and Echols, 2003), we predicted that if pointing does serve an interrogative function, infants should point less for an unreliable compared to a reliable informant. 16-month-old infants played with known objects together with an experimenter who was either correctly (Reliable Informant condition) or incorrectly (Unreliable Informant condition) labeling these known objects, as novel objects appeared behind her. Results indicated that infants pointed to the novel objects significantly more often in the Reliable than in the Unreliable Informant condition. Additional measures of infant's willingness to interact with and help the experimenter did not differ across conditions suggesting that these results were not due to a general preference for the reliable experimenter. This data supports the hypothesis that early pointing serves an interrogative function and may have been selected to support cultural learning.

A-007
Ownership protest in 2- and 3-year-olds following the investment of creative labour

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Property ownership plays an important role in many day-to-day interactions, but it is less clear how our understanding of ownership develops. We have recently demonstrated that preschool children transfer ownership after the investment of creative labour when directly asked to assign ownership of objects (Kanngiesser, Gjersoe, & Hood, 2010). In this study, we wanted to investigate whether children would also spontaneously claim ownership over things they have created and reinforce these claims not only for themselves, but also on behalf of third parties. For our study we adapted a protest design that had previously been used to study children's awareness of social rules (e.g. Rakoczy, Warneken, & Tomasello, 2008). Twenty-four two- and 25 three-year-olds played a craft-making game with a puppet and a second experimenter. After the players had each created an object, the puppet tried to keep all creations for herself. While 2- and 3-year-olds protested when their own creations were at stake, only 3-year-olds protested significantly on behalf of the second experimenter. When we asked children at the end of the game about the ownership of the creations, the majority of 3-year-olds assigned ownership to the respective creators of the objects. In contrast, 2-year-olds were only accurate in assigning ownership to themselves and to the puppet, but not to the second experimenter. Our findings indicate that from 2 years of age children spontaneously claim ownership following the investment of creative labour. However, they do not generalise these ownership claims to third parties until they are 3 years old.

A-008
Cue Salience: 9-Month-Old Infants Selectively Encode Goal-Directed Action Components

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Goal attribution plays a crucial role in infants' understanding of actions. Most studies report a preference for the goal over the path component. However, if the movement is salient enough, infants can also encode this action component. The purpose of this study was to investigate the role of cue salience in infants' understanding of goal-directed actions. For this purpose, we developed 3D films in which an inanimate object (ball) exhibited self-propelled movement and caused salient action-effects. In two experiments, 9-month-old infants were habituated to an event in which the ball rolled to one of two external goals. The infants were then presented with two test events: New goal/old path and old goal/new path. Different versions of the films, differentially marking the salience of action components, were presented: In Experiment 1 (N = 32), the salience of the trajectory was highlighted. In Experiment 2 (N = 25), the salience of the goal was increased. Comparisons of looking times between the test trials revealed different patterns: In Experiment 1 infants looked significantly longer at the old goal/new path than at the new goal/old path event, indicating that infants had encoded the path component. In Experiment 2, infants showed greater looking times on the new goal/old path than on the old goal/new path event, indicating a greater sensitivity for change in goal than change in path. These results support the notion that the salience of certain cues might be one of the important factors for infants' encoding of action components.

A-009
Infants' predictive eye-movements during non-human goal-directed actions

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It has recently been demonstrated that 12-month-old infants show predictive eye-movements when observing actions involving a human hand and an object, while such eye-movements are not found when the action involves only self-propelled balls (Falck-Ytter et al., 2006). However, other studies suggest that infants can attribute goals to non-human actions as long as the actions provide sufficient behavioral cues (e.g. Biro & Leslie, 2007). Furthermore, the efficiency of the action has been proposed to be one of the crucial

principles that infants apply to evaluate actions as goal-directed (Gergely & Csibra, 2003). In this study we investigated whether predictive eye-movements can be elicited if 9- and 12-month-olds are shown a non-human actor whose action is rich in behavioral cues suggesting goal-directed movement. In addition, the role of the efficiency of action in infants' predictive looking was tested by including two conditions in which the efficiency of the action toward the outcome was varied. An eye-tracker was used to record the infants' eye movements. We found that the eye-movements were predictive in both conditions. In addition, older infants produced significantly earlier predictive eye-movements in the Efficient condition than in the Non-efficient condition. These results suggest that actors do not necessarily have to be human in order to trigger infants' predictive eye-movements. Instead, we argue that the presence of certain behavioral properties of the action may be critical. The efficiency of the action influenced the timing of infants' predictive gaze, although a non-efficient action did not prevent infants from anticipating the outcome. Poster presentation

A-010

Developmental trajectories of the mother-infant attachment bond and their behavioural and (neuro)physiological correlates: a research in progress.

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A growing interest has been devoted to the definition of integrated approaches for the study of behavioural and neuro-bio-physiological correlates of affective-relational development, in terms of precursors and basis of the organization of attachment. The research can be divided as follow: a) studies that investigated the infant's early interactive competences and their role on the development of attachment at 12 months through stressful observational situations and the analysis of behavioral indicators. These studies highlighted inter-individual differences in affect, attention, touch and spatial orientation during the infant-caregiver interactions that seem then to be predictive of later attachment; b) studies which used classical experimental paradigm of cognitive and affective neuroscience (pc-monitor stimuli) and stressed that in the 1st year, infants are already able to process face and eye gaze and to perceive others' emotions and actions; c) studies focused on emotion regulation strategies integrating interactive abilities with neural and physiological correlates in 12 and 18 month-old infants which contributed to highlight the main role of the prefrontal cortex in the emotion processing. Anyway, at our knowledge no research about the early forerunners of infant attachment and their behavioral and neuro-bio-physiological correlates measured during "in vivo" interactions are currently available.

Starting from this perspective the present work is to describe an original research project that through a longitudinal design and stressful separation-reunion paradigm proposes to investigate behavioral (self-regulation strategies), physiological (cortisol and vagal tone) and neural (cerebral hemodynamic flux) correlates of infant-caregiver interactions at 3, 6, 9, and infant attachment at 12 months.

A-011
Locomotor Ability Modulates Infant's Looking Preferences for Biological Motion

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Experience with a new locomotor posture changes how infants choose to allocate attention to events in the environment (Gibson, 1988). In the research reported here we explored the relation between infants' locomotor abilities and their looking preferences for different kinds of biological motion. Experiment 1 investigated whether infants' mode of locomotion affected their looking preferences for crawling and walking motion. Twenty crawlers and twenty non-crawlers (18 female; m = 8.2 mos., SD = 1.2 mos.) were presented with pairs of crawling and walking point-light-displays. Results showed that infants looking preferences depended on their mode of locomotion: crawlers showed a preference for crawling over walking motion [t(19) = -2.39, p = .001], while the opposite was true for non-crawlers [t(19) = 3.94, p = .027]. Experiment 2 explored whether crawlers' preference for crawling motion changed as they begin to walk. Twenty-two infants (11 female; m = 12.1 mos., SD = 0.7 mos.) in the transitional period between crawling and walking were presented with the same motion preference test as Experiment 1. Infants also completed a motor skills test that assessed how they locomoted a fixed extent. Results showed that looking preferences for biological motion depended on the proportion of time infants spent walking [r(20) = .67, p < .001], but not on their age [r(20) = .05, p = .80]. In all, these results suggest that locomotor ability modulates infants' preferences for looking at motion. Once locomoting independently, infants consistently devote more attention to locomotor actions that they themselves can perform.

A-012
A Cross-cultural Comparison of Non-linguistic Vocal Behaviour in Human Infants

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In previous research we documented non-linguistic vocal communication of infants between the ages of 7 and 22 months in two Scottish nurseries. We identified several contexts in which vocal behaviour occurred: giving, protesting, requesting an action, requesting food and declaring. We found that the acoustic structure of the calls produced vary systematically with context, the possible evolutionary manifestation of a phylogenetically older non-linguistic referential calling system. To investigate the influence of the cultural background, we are currently conducting a comparison study with non-English speaking infants from villages in the Bujenje District, Uganda. About 20 children between the ages of 9 and 22 months are observed in their everyday natural interactions with people around them in order to make comparisons with THE context-specific vocalisations identified in the Scottish group. The study seeks to address whether context-specific prelinguistic vocalisations are part of a human universal and how individual experience affects vocal behaviour in terms of acoustic structure and communicative function. Results will contribute the ongoing debate about the nature of human communication prior to the advent of speech abilities.

A-013
Time-based Prospective Memory in Primary-School-Children: Contributions of Self-Initiated Memory Retrieval and Time-Monitoring Strategies

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The present study focused on time-based prospective memory (TBPM) during primary school age and possibly underlying mechanisms, in particular self-initiated memory retrieval and time monitoring strategies. Performance of 27 younger children (mean age = 7.2 +/- 0.55) was compared to that of 27 older children (mean age= 9.61 +/- 0.71). In accordance to Kvavilashvili et al.'s (2008) guideline for studying prospective memory in children and inspired by Kerns (2000), a new paradigm, the Dresden Cruiser, was developed. In this computerized driving game children had to navigate a car (ongoing task) and refuel the car before it runs out of gas (prospective memory task). Level of self-

initiation was manipulated by displaying the fuel gauge either permanently (low level of self-inititation) or displaying it only on demand (high level of self-initiation). As indicator of time-monitoring, fuel-gauge-checking was recorded in the high self-initiation condition. Results revealed age-dependent TBPM differences, with older children showing better performance in the prospective memory task. Level of self-initiation did not affect TBPM performance. In contrast strategies of time-monitoring influenced TBPM, as more frequent time-checks were associated with better performance. Moreover older children showed more time checks, with increasing frequency at time intervals near to refuelling target times. This pattern was also found in the younger age group, but only in the first three out of four prospective memory target intervals, showing difficulties in maintaining strategic time monitoring in younger children. Results are discussed with regard to developmental growth of executive capacities in early school age.

A-014
Is Rational Imitation in 12- and 14-month-old Infants Task-oriented?

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Recent research on rational imitation (Gergely et al., 2002; Schwier et al., 2006; Zmyj et al., 2009) has provided evidence that infants between 12 and 14 months take situational constraints of the experimenter into account and adapt their imitative behavior accordingly. When the constraints changed, the infants were able to work out the most effective action - the principle of rational action (Gergely & Csibra, 1997). The purpose of the present study was to investigate the flexibility and generalization of rational imitation skills in infants. We presented 12- and 14-month-old infants (N = 60) with four different imitation tasks. Preliminary results show that infants' imitation of the demonstrated unusual actions varied depending on the situational constraints of the model and the type of imitation task. In some of our four imitation tasks, infants took the situational constraints of the experimenter into account and adapted their imitative behavior accordingly. In contrast, infants in some of the other imitation tasks did not imitate rationally. These results indicate that one-year-olds' ability to assess the rationality of means in relation to the constraints of the situation is dependent on task characteristics. Factors that may have an impact will be discussed, for instance the detectability of the constraint, the familiarity of the action, or the salience of the action goal. It will be argued that consideration of these factors will help our understanding of rational imitation skills in infancy.

A-015

The social communication. A study on the neural basis of the early processing of communication in newborns.

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The processing of social information is a complex system at the base of the social development. One of the most important aspect of the social communication is the perception of social stimulus movements. Studies on the neural basis of the perception of the biological movements suggest that in both adults and 5 months old infants, the Superior Temporal Sulcus (STS) region would be a "biological motion detector" because it seems to be involved in the processing of any eye, mouth, hand, or body movements (Allison et al., 2000; Lloyd-Fox et al., 2009). In order to investigate the origins of this activation, the activity of newborns' brain in the temporal region had been observed in response to a social and communicative stimulus involving biological motion without the presence of a special category of stimuli like "faces" in comparison with non-biological stimulus using the NIRS technique. Nine healthy human newborns infants (M=72 hours) were recruited for the experiment. The stimuli were two video clips of a biological stimulus (hand) and non-biological stimulus (stick) grasping and moving a toy. We measured cortical oxygenation changes and similarly to the previous studies, we found, 7 s after the beginning of the stimulation, an increase in O2Hb concentration in the right lateral temporal cortex but only for the biological motion. The results demonstrate that the STS area is very early activated by different social stimuli involving biological motion.

A-016

The relationship between children's play and language skills in the toddler and early preschool period

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Various theoretical accounts propose that there are important developmental relations between pretend play and the development of receptive and expressive language, suggesting that both language and play stem from a single underlying cognitive capacity

reflecting the beginning of representational thinking (Charman et al., 2001.; Lyytinen et al., 1999.; McCune, 1995.; Thal and Katich, 1996.) The aim of this study was to investigate the relations of receptive and expressive language skills with frequency of pretend play and amount of play with peers, parents and other adults. The sample consisted of 42 toddlers (M=21 month, SD=2,92) and 36 early preschoolers (M=32 months, SD=3,25). Their receptive language abilities were measured with Reynell Developmental Language Scales, and their expressive language abilities with McArthur Communicative Development Inventories. Additionally, children's parents completed a scale measuring frequency of child's pretend play (adapted from McEwen et al., 2007) and answered questions about the amount of time child spends daily in play with peers, parents and other adults. The results show significant differences between age groups in both receptive and expressive language abilities, as well as frequency of pretend play. Generally, older children show better language abilities and engage in more pretend play. In both groups of children significant positive correlations were obtained between frequency of pretend play and receptive and expressive language skills. In addition, toddlers who spent more time playing with their parents obtained lower results on the measure of expressive language skills. Results are discussed in the context of contemporary theories of language development.

A-017
Natural Pedagogy and A-not-B tasks

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Gergely and Csibra's so-called "natural pedagogy" theory is intended to provide an explanatory framework for various social cognitive competencies, and particularly for infants' ability to fast-learn generic knowledge from adults. It hypothesizes that infants have an innate disposition to interpret ostensive-referential communication as conveying kind-relevant and generalizable information about a referent. By doing so, natural pedagogy accounts for infants' disposition to fast-learn semantic information about referent kinds ("knowledge-that"), and also for their disposition to acquire skills, such as, e.g., opening a certain kind of container ("knowledge-how"). In a recent paper, Topál et al. (2008) have appealed to natural pedagogy in order to explain a well-known phenomenon, namely the so-called "A-not-B errors". According to Topál et al., infants' perseverative search errors are due their pragmatic misinterpretation of the nature of the information conveyed during the habituation trials. Instead of taking it as episodic information about the location of the object in a particular game situation, infants (in ostensive communicative contexts) interpret the information as generic information about this object-kind. However, natural pedagogy alone is not sufficient to account for A-not-B errors, and has to be combined with other explanations. In order to do so, one needs to clarify the description of infants' search behavior in terms of natural pedagogy's hypotheses. I show that there is some unclarity left in such description. In particular, it is unclear what the referent about which the infant

expects to be taught new and relevant information is, and also what this information is. Poster presentation

14-month-olds Use Emotional Expressions to Predict the Outcome of Third-Party Interactions

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Infants' ability to interpret emotional expressions as a source of information about novel objects in their environment is well documented. However little is known about infants' ability to predict others' actions using such cues, especially towards social partners. This study tested infants' abilities to use emotional expressions to make action-predictions in the social realm using a design based on Gergely, Egyed and Kiraly (2007). 32 Fourteen-month-olds were tested using a looking-time paradigm. In familiarisation, two female actresses (expressers) directed opposing emotions (joy and disgust) towards two passive females (targets). In test each expresser was shown sharing food with the person towards whom she had previously expressed positive (congruent action) or negative (incongruent action) emotions, therefore 4 events in total. Following Gergely et al. (2007), the frequency of expresser presentation during familiarisation was manipulated, to test whether infants make attitude-based or object-centred expectations. A 2x2x2 ANOVA found a significant Expresser x Congruency interaction ($F_{(1, 30)} = 5.65$, $p = .024$) and non-significant trend for Condition ($F_{(1, 30)} = 3.11$, $p = .088$). A subsequent contrast analysis showed infants in the Asymmetric-frequency group looked longer at incongruent food-sharing by the frequent expresser ($F_{(1, 30)} = 8.37$, $p = .007$), but not by the infrequent one ($F_{(1, 30)} = .049$, $p = .83$). No effects of congruency were found in the symmetric-frequency group. Results suggest that infants as young as 14-month-olds can form expectations about 3rd party social-actions on the basis of emotional expressions.

Tuning the Link Between Words and Categories: Primate Vocalizations Facilitate Object Categorization for 3- But Not 12-Month-Old Infants

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Children acquire language at an incredible rate and one of the most persistent questions in cognitive science is how children accomplish this task. By the end of their first year,

labeling a series of objects with a common noun promotes the formation of object categories (e.g. Waxman & Markow, 1995). The goal of the current research is to explore how this process develops throughout the first year. In Study 1, 3- and 4-month-old infants participated in an object categorization task: Infants were familiarized to a series of category exemplars. For half of the infants, each exemplar was introduced with a naming phrase ("Look at the toma!"); for the remaining infants, each exemplar was paired with a tone sequence, matched to the naming phrase in duration, amplitude, etc. Infants in the labeling, but not the tone, condition showed evidence of object categorization (Ferry, Hespos, & Waxman 2010).

The goal of Study 2 was to identify the boundary conditions of this facilitative effect, and to trace its developmental trajectory across the first year. The visual stimuli from Study 1 were paired with either a) primate vocalizations, b) backwards speech, or c) low-pass filtered speech. At 3- and 4-months, a range of auditory stimuli promoted object categorization. But by 6- and 12- months, only forward labeling phrases guide categorization. This suggests that fundamental aspects of word learning may be built upon a broadly tuned mechanism that later becomes specific to language and individual words.

A-020
Learning from vowel variation in maternal speech in Gurindji Kriol

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Research with bilingual infants has found evidence of U-shaped development for vowels which differ in token frequency and are close together in the vowel space. Infants learning Gurindji Kriol, a mixed language of northern Australia, are exposed to a language in which the historical mix of two lexicons in this contact language has yielded considerable frequency disparities between vowels and also within-word vowel variation. In this study, a sample of maternal speech in Gurindji Kriol recorded by Felicity Meakins (2003-2006) was transcribed phonetically and analysed for frequency of vowel phone types and extent of vowel variation. Cluster analyses were performed on the same sample in F1-F2 space, to explore what vowel categories infants learning Gurindji Kriol might learn under the distributional learning hypothesis. The results suggest that using distributional data alone, an infant might, at least initially, set up fewer categories than the linguistic analysis suggests. Although the linguistic analysis suggests five vowel phonemes, the cluster analysis suggests that an infant might initially set up three vowel categories, and with further exposure, perhaps four then five vowel categories. If infants learn distributionally, the results imply that an adult vowel system may develop slowly when the input contains extensive vowel variation and frequency disparities between vowels.

A-021
Developmental correspondence between action prediction and motor ability in infancy

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How do infants understand the goal of others' actions? It has been proposed that action understanding results from a mechanism, in which an observed action is mapped onto the observer's own motor representation of that action. However, direct evidence of the direct matching process is spare in early infancy. Here, we show the developmental correspondence between action prediction and motor ability for the same action by analyzing gazing at and grasping objects in 4- to 10- month-old infants and comparing their behavior with adults. The onset of infants' ability to predict the goal of another person's action is synchronized with the onset of their own ability to perform that action. Moreover, there is one-to-one correspondence between them. Our findings indicate that the ability to predict others' action goals requires the corresponding motor ability, providing ontogenetic evidence for a direct matching process by a mirror neuron system.

A-022
Collaboration elicits equal sharing in children but not chimpanzees

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Humans share resources to a greater degree than do other great apes, and indeed much human sharing is governed by fairness and equity norms (e.g., Fehr & Fischbacher, 2003). One evolutionary hypothesis is that sharing is rooted in collaborative foraging, when multiple individuals must share the spoils of their joint efforts (Tomasello, 2009). We therefore investigated whether human children and chimpanzees would share more often after collaboration than in similar non-collaborative situations. Based upon the claim that the representation of collaboration in terms of joint intentions is unique to humans (Tomasello et al., 2005), we hypothesized that human children, but not chimpanzees, would differentiate between collaborative and non-collaborative interactions. We presented 2.5- and 3.5-year-old child peers (studies 1 and 2) and chimpanzees (studies 3-5) with a collaborative task to retrieve rewards by pulling ropes jointly. This collaboration condition was compared to non-collaborative conditions. Across conditions, one 'unlucky' subject gained 1 reward and the 'lucky' one 3. In study 1, we found that across age groups,

children shared more often after Collaboration than in a No-work situation (F(1,22)=21.9, p<.001). In study 2 we added a Parallel work condition in which both children had to work individually to get rewards. Only 3.5-year-olds shared more often in the Collaboration condition than in both the Parallel work and the No-work conditions (F(2,33)=13.8, p<.001). Chimpanzees never distinguished between conditions. This species difference suggests that humans' tendency to distribute resources equitably may have its evolutionary roots in the sharing of spoils after collaborative efforts. Poster presentation

A-023

Two sides to every story: the word learning benefits of rhyme versus prose in shared storybook reading.

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Child language acquisition is influenced by the context in which children are exposed to new words. Previous research has highlighted the positive influence of both joint storybook reading (e.g., Beck &McKeown, 2001) as well as repetition (e.g., Mather & Plunkett, 2009). The children's book industry was worth £405M in 2009, with four out of the top 5 early-learning books written in rhyme (e.g., The Gruffalo). However, current research has failed to examine if books that rhyme facilitate word learning for children. We tested whether hearing books that rhyme facilitates word learning. Specifically, we created an illustrated storybook to introduce 3-year-old children to two novel objects and their novel names. Children were either read a version of the book in AABB binary rhyme or a version that included the same words, but rearranged into non-rhyming prose. Importantly, all children received the same exposure to the novel word-object pairs. First, children were read the story three times. Then, they were tested on word learning trials with both pictures of the objects and the actual objects. Overall, children in the prose condition successfully learned the novel words. Children in the prose condition were significantly more accurate than children in the rhyme condition when tested with both pictures and actual objects. Children in the rhyme condition only showed evidence of word learning when tested with actual objects. This suggests that hearing storybooks that rhyme does not facilitate word learning (though there may be other benefits). Implications for language acquisition and children's literacy are discussed.

A-024

Mutual Gaze and Infant's Own Name in Infant Prefrontal Cortex: a NIRS Study

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A precondition for successful communication between two people is the detection of signals that indicate the intention to communicate. Eye contact and calling a person's name serve as important signals to establish communication. In adults, establishing communication by eye contact and calling a person's name results in overlapping activity in a part of prefrontal cortex implicated in mentalizing, suggesting that, regardless of modality, the intention to communicate is detected by the same brain region. In this study, we measured prefrontal cortex responses in 5-month-old infants using near-infrared spectroscopy (NIRS) to examine the neural basis and developmental emergence of detecting communicative signals across modalities. Infants watched faces that either signaled eye contact or directed their gaze away from the infant, and they also listened to voices that addressed them with their own name or with the name of another infant. The results revealed that there were two adjacent regions in the left prefrontal cortex sensitive to the communicative signals conveyed to the infant. Specifically, a medial left prefrontal region showed sensitivity to infants' own name, while a more lateral left prefrontal region responded sensitively to eye contact cues. Moreover, infants that responded sensitively to eye contact in the one region were more likely to respond sensitively to their own name in the adjacent region as revealed in a regression analysis, suggesting that responding to communicative signals in these two regions is functionally related. These findings suggest that, although 5-month-old infants are attuned to communicative signals directed at them, unlike adults, they do not recruit the same brain region when detecting communicative signals across modalities.

A-025
Point or crawl? Do infants have a preferred strategy of object retrieval?

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In most studies on infant requests and imperative pointing infants' movements are constrained and the object is out of reach. We investigate whether infants, when given the opportunity to move freely, retrieve an object out of reach preferentially by crawling toward it as opposed to requesting it communicatively from another person by pointing. In the study, E1 and infant inserted objects into a play chute. When the objects were used up, E1 retrieved more objects from a plate at 0.8 or 1.8m distance of the chute. After two repetitions, E1 remained at the chute. We measured whether infants either crawled or pointed to the plate to retrieve more objects (4 trials). Current results suggest that about half of our 12-month-olds crawl and half point. The distance of the plate did not play a role. An independent locomotion check confirmed that infants were generally able to crawl toward the object. All infants were also able to point, as was established by reports from the parents. We expect to be able to demonstrate that infants request things communicatively, even when they can obtain them themselves. The study is the basis for a comparative study with chimpanzees. In a follow-up condition we have omitted E1's modeling of crawling, and manipulate the retrievability of the object (data collection ongoing).

A-026
Action and Gesture Differentiate Pretend, Joking, and Literal Acts

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Distinguishing literal from non-literal acts (pretending, joking) should be a daunting task for toddlers. Distinguishing pretending (a technically wrong, but representationally right act) from joking (simply a wrong act) should be more difficult. We examined whether parents differentiated joking, pretending, and being literal with action and gesture cues. Parents played with 12 objects (four per condition) for 30 seconds each with their 20- to 23-month-olds. Parents said a target sentence, (e.g., "This is a shoe") and either played with the literal object (e.g., shoe), joked around with a noticeably different object (e.g., toy chicken), or pretended with a neutral object (e.g., sponge). Preliminary results suggest that parents used significantly more non-target actions (NTA; actions with objects unrelated to target sentence) when joking versus pretending, suggesting they do not believe the object

matched the target sentence. This converges with findings that parents use more verbal disbelief statements when joking versus pretending (Hoicka & Campbell, 2010). Parents used significantly more target gestures (TG, gestures related to target sentence) when pretending versus being literal. Parents may do so to convey the "rightness" of a representation of an act, which a literal act may convey in and of itself. Children used significantly more target actions (TA; actions related to the target sentence) during literal versus pretend, and pretend versus joking trials, and used significantly more NTA during pretend versus literal trials. This suggests that children picked up on cues (objects themselves, parental cues) to distinguish these acts.

A-027

Memory for permanent and transient object features in the context of communication

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We investigated whether the social context in which an object is experienced influences its long-term encoding. We hypothesised that when an object is observed in a communicative context, its permanent features will be preferentially encoded at the expense of its transient features.

In the first study, we presented brief movies, in which a demonstrator took a coloured shape from one of five black boxes either in a communicative or non-communicative context, while the participants' task was to memorise the location of the box from which the shape was taken. We found that the participants in the non-communicative condition recalled the location of the boxes better than those in the communicative condition, and moreover participants in the non-communicative group recalled the location of the boxes better than the colours of the shapes. Our second study tested whether the attention-modulating effect of communication influences memory for other, permanent vs. transient object features. This time the demonstrator took a coloured shape from one of five coloured boxes either in a communicative or non-communicative context, and the participants' task was to memorise the colour of the box from which the shape was taken. We found that the participants in the non-communicative condition recalled the colour of the boxes better than those in the communicative condition. Moreover, error analyses revealed that communication biased participants to respond with the colours of the shapes. These results suggest that, in situations involving communicative-referential signals, people tend to pay more attention to, and memorise more, the potentially kind-relevant, permanent object features.

A-028
18-month-olds use false belief understanding to warn others

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Recent research using looking based methods suggests that infants in their second year already expect others to act according to their false beliefs (e.g. Onishi & Baillargeon, 2005; Southgate, Senju, Csibra, 2007; Träuble, Marinović & Pauen, 2010). The current study examines whether 18-month-olds are able to not only recognize others' false beliefs, but also actively use their understanding of false belief when interacting with another person. Specifically, infants saw an experimenter (E1) remove an aversive object so that she could play with a toy in two boxes. Subsequently, she put the toy in one box (target), adjusted the position of the other box (distractor), and left. In her absence a second experimenter changed the scene such that both boxes contained an aversive object, and neither box contained the toy. We measured infants' spontaneous pointing upon E1's return. Preliminary data (n=19) show that infants pointed to warn E1 in anticipation of her false belief about the true contents of the target box and significantly less to the distractor box (Wilcoxon, p=.008). This is also reflected in infants' first point across trials (Wilcoxon, p=.03). In addition, the specific design used allows for the exclusion of an ignorance interpretation or low-level explanations, e.g. infants warned the experimenter about the box she last attended, or where they had last seen the toy. These results demonstrate infants' social pragmatic usage of belief-based action anticipations, and give further support for a rich interpretation of infant pointing.

A-029
Contingent reactivity as a trigger for referential communication in infancy

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Most cues indicating infant-directed communicative intention, such as eye contact and infant-directed speech, are derived from human-like features or human behavior. However, other signals, such as contingent reactivity patterns can provide a more abstract cue that allows for higher flexibility in finding communicative partners. Previous research suggested that young infants are equipped with a sensitive contingency detection mechanism to identify different levels of social contingencies from very early on (Gergely and Watson, 1996), often ascribing communicative agency to the entities they interact with (Movellan and Watson, 2002; Johnson, Slaughter and Carey, 1998).

In a series of studies involving 12-month-old infants, we explored the role of contingency perception in detecting potential communicative partners. Furthermore, we investigated whether contingent reactivity also triggers inferences related to the referential nature of communication. In Experiment 1 we demonstrated in an eye-tracker paradigm that contingent reactivity elicited by infants' incidental leg kicking is interpreted as cue for communicative intention. Infants followed the orientation change of objects significantly more often if these objects were reacting contingently to their behavior than that of non-contingent objects. In Experiment 2 we explored whether the orientation of the contingently moving objects is interpreted referentially. Recent findings (Yoon, Johnson and Csibra, 2008) demonstrated a striking effect of ostensive-referential cues (eg. human pointing) on infants' object representation. In a change blindness paradigm, the communicative context made infants more sensitive to changes in the identity of objects than to location changes. We applied a similar manipulation to our leg-kicking procedure and measured infants' looking time. Our data suggest that infants not only follow the orientation of contingently moving objects but they also show an encoding bias specific to ostensive-referential communication, even though no human agent is actually present.

POSTER SESSION B

B-001
Can 15-month-old infants fastmap object labels presented multimodally?

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This study investigated whether and how infants parse object labels that are presented multimodally. To investigate this question, infants watched films where an actress ostensively presented infants with the labels for two objects using gesture-word combinations. In the test phase, infants were assigned to one of three conditions: gesture +word, gesture-only, or word-only. After training, the objects would appear on the screen and, depending on the condition, the actress asked, "Where is the [gesture + word]?," "Where is the [gesture]?," or, "Where is the [word]?" Using a Tobii eyetracker, we determined whether infants had made the correct mappings. Specifically, the dependent measure was the duration of the first fixation to the target object relative to that of the non-target object (log-odds). Preliminary results using this measure suggested that infants tended to be better at fastmapping in the gesture-only condition than in the word+gesture condition, t(12)=-1.74,p=.11. In the gesture-only condition, infants' first fixation was to the target object significantly more often than would be expected by chance, t(7)=2.597,p=.036. This was not the case in the gesture+word condition, t(6)=-.642,p =.55. However, in a slightly altered version of the test which corrected for possible attentional biases, we found that infants did, in fact, also fastmap in the word+gesture condition, as measured by infants' first looks to the target object versus non-target object, t(7)=2.84,p=.025. Results suggest that infants will accept both spoken words and gestures as object labels, even when labels are presented multimodally.

B-002
Infants' expectations toward a person addressed with speech

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Infants anticipate the goals of others' manual actions (Falck-Ytter et al., 2006) but do they also anticipate the goals of others' speech? Twelve- and 24-month-old infants were eye-tracked while viewing videos where one adult (emitter) either uttered speech or produced non-speech vocalizations, while another (recipient) sat silently. To examine the effects of

gaze-direction, the adults either sat facing each other or back-to-back. The main prediction was that infants would have a stronger expectation of a response from the recipient following speech than non-speech. The dependent measures were how quickly infants switched their gaze from emitter to recipient (latency) and how likely infants were to look at the recipient, relative to the emitter, following the sound (log-odds). Results suggest that the 24-month-olds had a stronger expectation of a response following speech: They were significantly quicker to shift their gaze to the recipient following speech than non-speech, and when the adults were face-to-face, the infants were more likely to look at the recipient following speech than non-speech. In contrast, the 12-month-olds showed no significant effects for the latency measure, and were also less likely to look at the recipient following speech than non-speech when the adults were back-to-back. Together, the results suggest that 24-month-olds specifically expect others' speech to provoke a response from another, whereas 12-month-olds do not. Given that infants are far more experienced speakers at 24 than 12 months, they may gain this insight into the social function of speech through using it to influence others.

B-003
Shared pretense communicates general knowledge

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Childhood is a time of learning facts about the world. In learning about the world, children must acquire specific knowledge about particular things (e.g., a pet cat) and general knowledge about kinds (e.g., cats in general). Although general knowledge can be acquired through direct experience with things (Prasada, 2000), this is not always possible (Harris, 2002). Children cannot learn that sharks eat fish by interacting with sharks, because they are not easily accessed, and are dangerous and rare. Certain knowledge must be acquired in the object's absence. We propose that sharing in pretend-play may allow young children to acquire such knowledge. One reason this might be true is that shared pretense is socially interactive. This social interaction may suggest to children that another person intends to communicate knowledge (Csibra & Gergely, 2009). In two experiments, preschoolers watched pretend-play scenarios enacted with a puppet of a nonexistent animal species. Each scenario demonstrated some fact about the animal, (e.g., dislikes eating a carrot). In Experiment 1, the fact was conveyed by the puppet "speaking". For instance, the experimenter said, "Carrots, blah, yuck" in a high-pitched voice while moving the puppet. Experiment 2 featured no pretend sounds; the fact was communicated through actions alone. Following the scenarios, children were asked open-ended generic questions corresponding to the scenarios. Children's responses were consistent with their having learned general facts, and this occurred even when the scenarios lacked any pretend speech or sound-effects. The findings reveal a long-overlooked means by which children can acquire generic knowledge.

B-004
Infants' comprehension of third-party gestures

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How do infants understand gestures directed to others? Previous research suggests that they comprehend the referent of a point directed to a third person (Gräfenhain, et al., 2009), but do infants also comprehend the varying meanings behind different communicative gestures, such as requesting? In the current eye tracking study, 14-month-old infants observed one person (Gesturer) either make a request gesture (palm-up) or a stop gesture (palm facing forward) toward an object. A second person then took the object and moved his hand behind a barrier so it was ambiguous whether he would give the object to the Gesturer or take it for himself. Preliminary data show that on the first trial, infants who saw the Gesturer request the object anticipated her receiving it (proportion anticipatory gaze to gesturer = 0.88; t(7)=3.0, p=.02), while those who saw her make a stop gesture were at chance (proportion gaze = 0.34; p>.05). In addition, infants had a general bias to anticipate the object being given to the Gesturer. That is, over six identical trials, infants across gesture conditions learned to anticipate the object being given already by the second trial (proportion gaze = .88, t(7)=3.0, p=.02) and continued to anticipate the giving outcome through the remaining trials, however infants never learned to anticipate the object being taken (p's for each trial >.05). These findings suggest that infants do have some understanding of communicative gestures directed to others and that they have a general prosocial bias to expect people to share objects.

B-005
Young Children's Reasoning Strategies Using an Ignorance Belief Task

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Despite the abundance of research concerning children's understanding of other minds, there are only a few that concern children's theories of both human and non-human minds (Barrett, Newman, & Richert, 2003; Barrett, Richert, & Driesenga, 2001; Gimenez-Dasi, Guerrero, & Harris, 2005; Knight, 2008; Knight, Sousa, Barrett, & Atran, 2004; Lane, Wellman, & Evans, In press; Makris & Pnevmatikos, 2007). As children actively reason about non-human agents, demonstrated by their interest in religious and magical thought, we still have much to understand how children think about various kinds of minds. Even so,

results from these studies diverge on how children reason about non-human minds making conclusions unclear. Some results suggest that young children are reasoning egocentrically depending on the task (Makris & Pnevmatikos, 2007), that they have a reality bias (Lane et al., In press), and that children over-attribute knowledge to non-human agents (Barrett et al., 2003). To investigate reasoning behaviours, British and Israeli children, aged 3-5 years, were given an ignorance belief task and an adapted ignorance belief task, (e.g. false belief tasks where the children remain ignorant of the contents inside a box). Results show that the youngest children did not reason from an egocentric or anthropomorphic bias. Instead, the youngest children in the Israeli sample could significantly reason about humans above chance and the British children could reason about one supernatural mind below chance. Both samples could distinguish between supernatural and human agents above chance.

B-006
Young Children Help Others To Achieve Their Social Goals

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Children are strongly motivated to help others. The studies that demonstrate this motivation, however, have all focused on children's prosocial behavior in response to a person's physical, instrumental goal, for example, attempting to obtain an out-of-reach object. Yet, given the inherent sociality of our species, some of our most common goals are social. For example, in almost every social interaction we engage in, we seek to communicate with our social partners. We had 3-year-old children observe an experimenter attempting unsuccessfully to get the attention of a lifelike puppet from across a room. We measured whether children would help by informing the puppet that the experimenter was trying to get her attention. In a within-subjects design, children also experienced a control condition in which the experimenter called to a different puppet instead. This condition controlled for children's baseline motivations to inform the main puppet about the experimenter's calling behavior, even when it was not directed towards her. Of 15 participants tested who passed an instrumental helping pre-test, 7 informed the main puppet about the experimenter only when the experimenter was calling to her directly, while none informed the main puppet about the experimenter only in the control condition (McNemar's test, p = .016, data collection ongoing). Three participants informed the main puppet in both conditions. These results demonstrate that children do not only help others achieve their instrumental goals; they also spontaneously help them achieve their social goals. Ongoing research investigates the development of this motivation in younger children.

B-007
Bodily orientation of an inanimate agent modulates 12-month-olds' expectations about its behavior

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Agent's bodily orientation can be an important source of social information guiding interpretation and reasoning about an agent's action. It matters for judging action as intentional or not and provides cues about the epistemic state of an agent. Human infants early in the first year of life take into account the orientation of human agents performing goal-directed actions and several non-human species have been shown to monitor orientation of humans and/or conspecifics in social interactions. Still little is known about how orientation of goal-directed inanimate agents is monitored by infants and whether it can influence their expectations about the agent's behavior. In the present study 12-months-old infants watched short animations showing an inanimate agent reacting contingently to the behavior of a target-object. In test trials, after just a 2-trial-long familiarization, the agent stopped reacting to the target-object's entry. Infants were faster to look away from the AOI (which included the agent and the target) on test trials showing the non-reactive agent oriented away from the target-object than on test trials showing the same agent oriented towards the target. This looking-pattern suggests that the inanimate agent's orientation modulated infants' expectations: if the target emerged behind the agent's back, infants were faster to give up on the expectation that some movement will eventually happen. The same expectation pattern was observed regardless of whether the agent's front was marked by an iconic human-like face or not, suggesting that the motion alone provided enough cues about the agent's bodily orientation.

B-008
The role of intermodal synchrony in maternal input to 3-month-olds: a naturalistic study with special focus on the interplay between language and action

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Recent work has suggested, that linguistic development is driven by the infants' ability to use a coalition of attentional, social and linguistic cues inherent in the input provided by their social environment (Hollich et al., 2000). Depending on developmental stage, they use different cues. Very young infants take advantage of attentional cues, using the

acoustic properties of language overlapping with action sequences to help them segment the world into units like objects, actions, or events (Hirsh-Pasek et al., 1996). Yet, few studies have provided a systematic account of how language and action are coordinated and embedded in everyday interactions between caregivers and their preverbal infants. To gain insights into the action-language interplay of maternal stimulation, we conducted a naturalistic study. We filmed German mothers and their three-month-olds (N=16) in their homes during diaper changing. Applying a micro-analytical approach, we coded maternal body movement when synchronized with vocal practices. The data were analyzed qualitatively, identifying synchrony classes and classes of vocal activities. Furthermore, we analyzed data quantitatively, using frame-to-frame analysis, aiming at investigating the interactional extent to which synchrony is provided in this everyday setting. We found that an average of 71.96% of the maternal vocal stimulation was characterized by intermodal synchrony. These results suggest that during early interactions with infants, German mothers vocalize in a tight relationship with action, "packaging" their actions acoustically and making language perceivable and tangible to the infants, a behavior which may drive language and action acquisition.

B-009
The Implicit Association Test in Capuchin monkeys (Cebus apella)

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A mounting body of evidence suggests that human beings possess unconscious, implicit attitudes that lead to prejudice along a variety of dimensions. In particular, research using the Implicit Association Test Prior, or IAT, suggests we have implicit attitudes against racial minorities, homosexuals, and outgroups of various kinds. Despite a wealth of research available on the existence and nature of implicit attitudes, the evolutionary origin of these attitudes remains unstudied. I've extended research on implicit attitudes beyond the human species, to the brown capuchin monkey (Cebus apella), a New World primate. I hypothesized that capuchin monkeys, like humans, possess measurable implicit attitudes. I first found that the monkeys were faster and more accurate when two positive categories, fruit and toys, shared a response button, and two negative categories, spiders and veterinary tools, shared the other response button, suggesting that they do have positive and negative attitudes that can me peasured using the IAT. I next found differences in reaction time and accuracy when categorizing own-species vs. individuals from another member of their genus, white-faced capuchins (Cebus capucinus). This research takes the first steps towards uncovering in these monkeys the evolutionary origins of our own implicit attitudes towards social groups.

B-010
The development of pointing comprehension in infancy: Referential language supports shifts of covert attention

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In adults, language and action are assumed to form an integrated system in which both influence each other. Less is known about this interplay in infants, when production and comprehension of language and action develop. Here we investigated the influence of referential language on infants' pointing comprehension measured via covert shifts of attention. Infants have been shown to shift covert attention when observing grasping actions or gaze shifts. But less is known about whether infants' attention can be modulated by pointing actions and the degree to which referential language is beneficial in this context. Twelve-month-olds were assigned to one of four conditions. The basic paradigm consisted of the presentation of a pointing hand (cue) followed by a peripheral target at a location congruent or incongruent with the pointing direction. Cue presentation was accompanied by different acoustic signals: referential language (condition 1, "Look!-There!"), reversed language (condition 2;"Kool!-Ereth!"), artificial sound (condition 3;"Bim!-Bam!"), or no sound (condition 4). Saccadic reaction times (SRTs) from cue to target were measured. The congruency effect (SRT-difference between congruent and incongruent trials) increased the more referential and human the acoustic signal was, with a significant congruency effect only being present in the condition with referential language. This indicates a beneficial effect of referential language on the comprehension of pointing actions emphasizing verbal communication as an important factor facilitating social understanding across domains including gaze and pointing. These findings additionally suggest a close interrelation of language and action already at one year of age.

B-011
Children's use of evidential markers to deal with conflicting information

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Much of what we know does not come from our own direct experience but rather from others' testimony or input. Therefore, distinguishing trustworthy sources from those that are not is an important skill both adults and children should posses in order not to be misled. The present study focus on Turkish-speaking children's sensitivity to grammatical information-source cues, evidentiality markers, in actively resisting erroneous information from others. In a modified misinformation paradigm, the findings reveal that Turkish children, as young as 4 years old, (a) are less suggestible than their American peers, (b) reliably prefer learning from direct sources, i.e. perception [-DI] over indirect ones, i.e., hearsay [-MIª]. Taken together, these findings contribute to our understanding of how language interacts with children's epistemic understanding. Poster presentation

B-012
The beginning of cooperation: behavioral evidence at 14 month of age

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According to Bratman definition (1992), cooperation is characterized by three main features: a) mutual responsiveness; b) commitment to joint activity and c) commitment to mutual support. Previous studies on infant-adult cooperation (Warneken et al., 2006; 2007) only focused on the first two features. Our aim was twofold: 1) to investigate all the three features in a single cooperation task and 2) to investigate individual differences as a function of selected socio-cognitive abilities. 48 14-month-old infants were administered a cooperative problem solving task with an adult. In that task - "duck task" - infants were required to pull an handle attached to one side of the box to open a balancing door in the opposite side, which, in turns, allowed the experimenter to retrieve a toy-duck. Each child was also observed in three additional tasks - turn-taking, communicative and helping tasks - to explain individual differences in cooperation with socio-cognitive abilities related to the three cooperative features. In line with Warneken & Tomasello (2007), results showed that: a) quite all infants collaborate with the partner to allow her to retrieve the duck, but in a poorly coordinated manner; b) most of them tried to re-engage the partner when she refrained to retrieve the duck, by using actions as communicative signals; and c) very few

supported the adult when she was not able to end the task, by ending it in her place. Moreover, we found that individual differences in the cooperation task were related to infants' turn-taking and communicative abilities.

B-013
The Effect of Robot-Child Interactions on Interpersonal Coordination

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Spatial and temporal coordination is a ubiquitous property of human interactions and plays an important role in social and cognitive development. As a part of a larger investigation of whether robots can help improve the social and motor coordination of children with autism, we tested the effect of human-robot interaction on interpersonal coordination. Typically developing children (ages 4-7 years) were tested before and after a 4 week (8 sessions) training period, which included various robot imitation tasks. During the pre- and post-tests, children were asked to join a leader in a "copying game" which contained several simple tasks, such as clapping, marching, or shaking maracas. During the tasks, we collected movement data with a Polhemus motion tracking system. Cross-recurrence analysis, a method for quantifying the relationship between two time series, was used to analyze the motion data. On the pre-test, older children showed stronger interpersonal coordination with the the adult "leader" than younger children. Further, the robot training had a greater effect on the interpersonal coordination of the older children compared to their younger counterparts. Our results suggest that training involving robot-child interaction may improve the child's coordination with adults.

B-014

The development of understanding the informative gaze during the second year of life

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Children's understanding of the informative gaze has been investigated with an object choice task, in which an adult, after hiding an object in one of two containers out of the child's sight, gazed at the correct container in an ostensive manner. Although using the above paradigm, studies disagree about the age at which this ability emerges: some studies found a successful performance at 14 months of age (Behne et al., 2005), whereas some other found a random performance in 18-month-olds (Aureli et al., 2009) and 27-month-olds (Povinelli et al., 1997). The present study aimed to add further evidence on the development of the understanding of the informative gaze by observing infants longitudinally in the second half of the second year. To that aim we examined infant behaviour after the gaze cueing, by distinguishing correct and incorrect choices, and infant looking behavior during the cueing, by distinguish the infant looking to the experimenter, to the cued container or elsewhere. 49 subjects were observed in the object choice task when they were 18-and 24-month-olds. Results showed that correct responses were significantly more than incorrect at both ages. Moreover, they increased from 18 to 24 months of age. Finally, whereas correct choices were not related to infant looking behavior at 18 months, they related positively to looking to the cued container at 24 months. We also compared results at 18 months to our previous study showing a lower performance, finding a learning process as a possible mechanism explaining the present higher performance.

B-015

A developmental approach of autobiographical memory and the self: developmental profile and underlying mechanisms

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Autobiographical memory (AM) is now recognized as being multifaceted, containing a corpus of general knowledge related to the self, as well as unique experiences specific to an individual, which have been accumulated since childhood (Conway & Pleydell-Pearce,

2000; for a review Piolino et al., 2009). Although some authors suppose that children as young as five years old have functionally mature AM, we demonstrate in a series of studies that AM become fully operational late (during adolescence), when AM is assessed thanks to a strict and rich definition. In a first study, schoolchildren aged 7-13 years were asked to recall semantic personal information and episodic events from three different time periods. We highlighted developmental differences between the episodic and semantic subcomponents of AM: semantic AM was characterized by a relative developmental invariance whereas age-related differences were observed for episodic AM. Two other studies were then conducted to specify the mechanisms behind episodic AM development. We showed differential profile of development depending of the feature assessed: the objective quality of the memories (e.g. number of details recalled) reached mature level earlier whereas subjective quality (autoevaluation of the feeling of reliving) increased until adolescence. Moreover, the development of the different episodic AM features was partly mediated by indirect effect of age on language abilities, personal semantic memory and working memory. Thus, our results support the view that episodic component of AM develops until adolescence, bound up with the increasing efficiency of cognitive abilities.

B-016
Can Reading Intentions Help Infants to Understand Pictures?

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According to DeLoache's (review 2002) studies on picture-based retrieval task, infants from 24 to 31 months start to understand the specific relationship between a picture and its referent. In the same age they are sensitive to a drawing person's intention if they have to understand what the picture depicts (Preissler & Bloom, 2008). We investigated whether we can facilitate the retrieval performance if the intentional origin of the picture, namely the artist's intention is explicitly available for the infants. 32 children (24-31m; mean age: 27m) participated in our study. In Experimental Condition (ExC n=16) the infant meets the Experimenter (E) who wants to draw something (four target objects) from a dollhouse. The infant observes her action and then identifies the objects and colours the drawings. In Control Condition (CoC) E asks the infant to identify something in the dollhouse (same four target objects) and find the replicas. The test is a retrieval task for both conditions: a pillow is hidden in six different places in the dollhouse (counterbalanced order) and E draws where she hid the pillow. The child has to find the object based on the pictures. ANCOVA revealed no gender but condition main effect (p=0,02; F=5,76) without interaction. ExC resulted in a better retrieval performance independently from the covariant age effect. Our data confirm: if the intentional nature of pictures is explicitly available, children perform better in using a picture as a guide for action. It suggests that social-mindedness is in close relation to symbol-mindedness in human development.

B-017

How do typical children and adolescents with autism learn to make accurate predictions in a launching paradigm?

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We considered explicit preconceptions about object motion and subsequent revision after observing a launching scenario. Kim & Spelke (1999) demonstrated typically developing three- to five-year-olds' preconceptions were inaccurate when they predicted where a ball would land after launching off a ramp. We replicated this with three- to eight-year-olds (n = 190). To examine learning we demonstrated the outcome five times, once after each prediction. Older children were more likely to predict the correct (parabolic) outcome than younger children, indicating they revised their explicit preconceptions in accordance with their observations. Language ability and executive factors did not explain response patterns. The launching apparatus was presented to adolescents with autism (n = 26) and typical peers (n = 26). Preconceptions were mostly accurate (67%) in the typical group. All typical participants made correct predictions after observing the outcome once. Preconceptions were variable in the autism group. Only 31% initially made a correct prediction; 38% of participants still made inaccurate predictions after observing the outcome twice. The number of correct predictions by adolescents with autism was related to language ability, but not to non-verbal reasoning or executive factors. We cannot say which mechanisms underlie the developmental trend in belief revision by typical children. Individual differences in revision of explicit preconceptions about object motion were related to language ability for the adolescents with autism. Perhaps inner speech plays a modulating role for 'insistence on sameness' in autism (Szatmari et al., 2006).

B-018

Do infants encode features and geometry in a two-dimensional environment?

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Geometric form perception and its role in reorienting process have been studied extensively in human children, but little is known the early ground of the reorientation in infancy. Here, we present findings of three experiments that used looking-time paradigm to test infants' sensitivity to geometric and feature information in two-dimensional visual displays. One-year-old infants participated in the spatial search tasks, which were manipulated due to the display movement (static, visible rotation, invisible rotation) and the available spatial information (geometric and feature). The findings from this study show

that toddlers around 12.5 months of age, are sensitive to the relevant geometric as well as featural cues but only in the case when infants were not fully disoriented. Infants were not able to follow the rotation of the spatial configuration either the rotation was invisible or featural information were not available. Implications of these findings for human infants represent geometric cues are discussed.

B-019

Preschoolers Make Inferences About Feature Centrality on the Basis of Intentional Demonstration, but not Intentional Action

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Recent work (Csibra & Gergely, 2009) suggests that children are sensitive to whether information is conveyed pedagogically. They use pedagogical cues to infer importance and stability within an individual (e.g., Yoon, et al., 2008), and may use such cues to make kind-based inferences (Butler & Markman, 2010; Futó et al., 2010). Here we asked if children use pedagogical cues to infer that a property is an essential and defining feature of a novel kind. We showed preschoolers that a novel object (a "spoodle") had a particularly property (magnetically picking up paperclips) in one of three ways: pedagogically; intentionally without pedagogical cues; or accidentally. We the asked children to sort a set of exemplars: half were identical to the demonstration block, half were another color; and only half of each color had the property. Children were more likely to sort by function in the Pedagogical than either the Intentional ($p = 0.005$) or Accidental ($p = 0.005$) conditions. Additionally, children were more likely to sort by color in both the Accidental ($p = 0.002$) and Intentional ($p = 0.04$) conditions. Additionally, children tested the objects' functionality more in the Pedagogical than either the Intentional ($p = 0.01$) or Accidental ($p = 0.005$) conditions. Despite findings that children reliably make perceptually-based category judgments (e.g., Landau, Smith, & Jones, 1988, 1998) at least without cues such as kind labels, here children used a novel function to categorize when it was demonstrated—but not when an object was simply intentionally used for a function. Poster presentation

B-020

Understanding of deception in 1-Year-Olds

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The recognition of deceptive gestures, acts and behavior plays a significant role in the social and cognitive developmental process. Deceptive communication has been recently researched in many studies, but little is known about what happens around the first years of age. In our previous experiment we focused on the role of joint visual attention and

communicative gestures in 9 and 12- month-old infants. Our findings of this study suggest that joint attentional interaction generates a new learning situation, wherein the infants not only recognize the communicative gestures, but they understand the intentional teaching behavior of an adult too. On the base of these results we would like to examine the comprehension of deceptive gestures and unreliable communicative intention in 1-year-old infants. We measured the infants' reactions in two different problem-solving situations. For the first group we generated a trusty,safe environment with reliable gestures and joint attentional interaction. In contrast, in the second group we wanted to mislead the infant with deceptive,unreliable communicative gestures. Our main aim was to prove, that by the help of triadic interactions and communicative gestures already one-year-old infants will be able to distinguish the reliable source of information from the other one. Our findings will be discussed in terms of social cognitive developmental science.

B-021
Language comprehension and space representation: words as tools

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According to "embodied" theories cognition and language are founded on action. Nevertheless these theories did not sufficiently address the kinds of actions that language allows us to perform. The goal of this study was to verify if, similarly to tools (Clark & Chalmers, 2007), also words use can modify our space representation, extending our perceived reachable space (Berti & Frassinetti, 2000). We tested a group of children and a group of adults (3-10; 15-25 years-old). We showed participants with objects located in the peripersonal space, extrapersonal space and in the "border space", i.e. reachable extending not just the arm but also the back. Before and after a training session participants had to estimate the distance of each object and to push a toy-car near to the object. During the "tool-yes"/"tool-no" training sessions they used a rake that allowed vs. didn't allow to reach and grasp the object located in the extrapersonal space. During the "word-yes"/"word-no" training sessions the use of the right linguistic label allowed vs. didn't allow them to receive and grasp the object located in the extrapersonal space. We found that after the "tool-yes" training session participants consciously perceived (verbal estimations) the border space as extended; crucially the toy-car acceleration analyses (implicit space representation) showed an extension of the border space also after the "word-yes" training session. These preliminary results seem to show that words are similar to tools: object-name allow us to "catch" the object, so that we perceive it as closer than it actually is.

B-022
Is Cooperation Relevant Enough to Copy? Imitation of Goal-Directed Action Demonstrated by Single vs. Two Cooperating Models in Preschoolers

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Recent studies (e.g. Lyons et al., 2007) suggest that children from two years of age copy model's causally irrelevant action while younger can imitate selectively (e.g. Gergely et al., 2002). We suppose if preschoolers are forced to select they copy more relevant steps than irrelevant ones but observing actions with two cooperating models they are ready to imitate the role reversing social pattern even if it is unnecessary to achieve their goal and a prosocial action will be imitated more times in this case as well. Twenty-two preschoolers (M=5;1y, 4;1-5;11) participated in condition with two cooperating models (2M) or with one model (1M). Each child watched a videotaped and narrated sequence of actions twice, including relevant and irrelevant steps. After achieving the goal, prosocial action was demonstrated only in 2M condition. During the test they could play with an examiner and the apparatus. 2x2 ANOVA revealed main effect of relevance (p=0.0001; F=191.456), no condition effect or interaction. Children in both conditions imitated more relevant steps than irrelevant ones (p=0.001; t=-9.587; p=0.001; t=-10). The preschoolers in 2M reversed the roles more times than in 1M (p=0.002; t=3.532; df=20). The proportion of role reversing children in 2M differed from 1M (Fisher-exact p=0.018), but the proportion of prosocial actors did not (chi2=1.636; p=0.201). Our data show that preschoolers imitate selectively as they tend to skip physically unnecessary steps. However, they (over)imitate causally irrelevant but socially significant aspects of an action while the amount of prosocial action in 2M is not exceed 1M.

B-023
Moral Intuitions in Early Development

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We revise the development of morality, stressing that it originates from reciprocal social exchanges and negotiation from which meanings, values and norms are constructed with others. The emergence of reciprocal exchanges allow for the social construction of meanings that drive human transactions, e.g., shared ideas or values such as the sense of

what's right and what's wrong, the sense of possession. However, what makes negotiation particular as a process is the fact that the outcome is agreement, an inter-subjective agreement on values. Here we make a case for the sentimentalist approach of morality, which claims that we are perceptually tuned to the emotions and emotional responses of others, and to our own emotional responses to others. We are morally educated by our feelings. Even before being able of making moral decisions and having moral beliefs, children are capable to show preferences and to attribute values to things, situations, and persons even if they don't know how to justify their values. It means that moral values emerge in development before children develop the capacity of meta-representation of moral situations, and understanding moral prescriptions. Our hypothesis is that an intuitive ethics guide the child moral development. Moral norms are grafted on top of our dispositions to respond emotionally in characteristic ways to stereotypic stimuli. We are biologically prepared to develop moral cognition, but not because our minds are adapted to moral concepts and principles, but because moral cognition is a natural development of our existing emotional, intellectual and social repertoire.

B-024
Early birds: development of metaphor comprehension

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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, the 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.

B-025
Eye Gaze and Task Demand in 2-to-3-year-olds Belief Reasoning

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Infants' succeeded in false belief reasoning measured by looking time and by anticipatory looking early in life. Will the implicit eye gaze measures be sensitive to the demand of executive processes? Here we test low and high demand false belief task (LD and HD), with the anticipatory looking paradigm (Southgate, et al., 2007). We used a Tobii T60 Eye Tracker to explore 2-to-3-year-olds gaze behaviors in LD and HD false belief, and a true belief (TB) conditions. 44 subjects participated, 13 in TB, 16 in LD, and 15 in HD. Each subject watched videos showing two main familiarization trials similar to those in Southgate et al. (2007). In the test, while the actor had her back turned, the puppet transferred the toy to the other box (HD), or removed the toy and left with it (LD). In the TB, the actor turned around when the puppet was still transferring the toy from one box to the other. After the actor turned back, without showing any outcome, the video froze for four seconds while the eye tracker recorded subjects' eye gaze towards each key location as their anticipation. Children's performances were similar in the HD and TB, and they were more likely to look at the true belief locations. But they showed the opposite preferences to the false-belief locations in LD. These results suggested that 2-to-3-year-olds' implicit eye gaze was also subject to the demand of the belief tasks.

B-026
When the to-be-remembered feature is an agent's goal: infant WM capacity for goal-relevant features

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Traditional looking-time studies of infants' visual working memory (WM) for object features show a that this capacity is severely limited. However, in the real world, infants are constantly observing social agents acting upon objects. How might WM capacity estimates change when the to-be-remembered feature is relevant to an agent's goal? In the current study, a goal-attribution task (e.g. Woodward, 1998) was combined with a WM task (e.g. Kaldy & Leslie, 2003; 2005). Infants between 6- and 12-months of age were tested. Stimuli were shown on a Tobii T60XL Eye Tracker. Infants were shown 4 familiarization trials in which two shapes were placed on a stage and an agent consistently chose one shape over

the other. During test trials, the shapes were placed behind screens so that they were hidden from the infant but visible to the agent. The agent then reached to the location opposite the goal location and pulled out either a) the object hidden at that location or b) the goal object. Anticipatory eye gaze and gaze duration were measured. Infants in all age groups made anticipatory eye movements to the goal location and looked longer when a memory-inconsistent shape was revealed, indicating they understood the goal and recalled the location of the shape. This result is especially interesting since 6-montholds fail in a typical WM task but show success in the goal task. Implications for the intersection of WM and social cognitive development will be discussed. Poster presentation

B-027
Anticipation as an Alternative for Understanding Imitation Activity

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The current paper offers an alternative perspective on understanding imitation. An anticipatory perspective on representation and motivation provide the relevant modeling resources to begin exploring children's understanding of imitation situations from within the interactivist framework (Bickhard, 2009; 2003). From an anticipatory perspective, imitation functions as a resource for the ongoing and future activity of the child. Importantly, understanding imitation activity as a means of utilizing others as a resource for further activity means that imitation itself is going to involve learning and development (Jones, 2007) both in the sense of what children are able to imitate (cognitive aspects) and in the sense of what they select to imitate (motivational aspects, Kaplan & Oudeyer, 2007). Further, recognizing that imitation is necessarily general (Nehaniv & Dautenhahn, 2002) refocuses our attention on the inherent selectivity of all imitation activity. The question of what exactly is being learned from an observation of others is still central to this shift in perspective but the demarcation of different forms of social learning (e.g. mimicry, emulation, "true" imitation) in terms of the degree of fidelity between model and subject is no longer the essential variable. Rather, the crucial differences between types of social learning are going to depend on the underlying psychological processes involved - cognitive and motivational processes. Finally, a constraint imposed by an anticipatory (interactivist) conception of representation (Bickhard, 1992) forces the "conceptual exodus" of any form of mindreading for all imitation activity prior to age 3.5-4.

B-028
Differential effects of communicative presentation on the encoding of visual features vs. numerosity of sets of objects in 9-month-old infants

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Recent research has focused on how communicative signals aid infants in learning generalizable, enduring, kind-specific information about objects during the first year of life (Yoon, Johnson & Csibra, 2008). In the current study, we examine the effect of ostensive-referential signals on infants' detection of changes of kind vs. number of small sets of objects. Infants detect changes in small numbers of objects at about seven months (Starkey & Cooper, 1980), but do not spontaneously notice changes in object kind until sometime between 10-12 months (Xu & Carey, 1996). However, presenting objects in an ostensive-referential context might promote attention to identity-relevant features as enduring and potentially generalizable information, while number might be ignored as situation-specific. To investigate this claim, we tested 9-month-old infants with a change detection paradigm, in which infants watched as an experimenter presented and then hid a set of objects behind a screen, which lifted to reveal a change in kind or number. In one version, the experimenter was visible; in another, mirroring a traditional object-tracking paradigm, only her arm was visible. In addition, infants participated in either a non-communicative or a communicative version of the study. As expected, infants in the non-communicative condition looked significantly longer at number changes than kind changes. However, the pattern of looking reversed in the communicative condition – infants looked significantly longer at kind changes than number changes. In ostensive-referential contexts, infants preferentially attended to kind-relevant features over set size.

B-029
Sensitivity to social dominance relationships in human infants
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Background: Humans and other primate species are known to monitor social dominance relationships. However, the ontogeny of this capacity is mostly unknown. We tested human infants' attribution of dominance relationships to computer-animated characters in a violation of expectation paradigm. We defined dominance as the capacity to prevail in conflicts over resources. During familiarisation trials, infants observed a "dominant" agent succeeding when its goals conflicted with those of another agent. During test trials, the dominant agent either succeeded again or retreated in a new conflict situation.

Results: (i) Twelve-month-olds (but not 9-month-olds) expected the hierarchical relationship between two individuals to remain stable from one conflict (competition for a ball), to another, similar type of conflict (competition for a cube). (ii) Moreover, 15-month-olds (but not 12-month-olds), extended their expectations across completely different conflict situations (from a competition to occupy a place to a competition for a cube). (iii) While 12- and 15-month-olds expected the hierarchical relationships to remain stable, they did not have any expectation when a previously dominant individual was observed to compete against an agent it had not been seen meeting before.

Conclusions: (i) Human infants' understanding of conflict allows them to identify dominance relationships in the absence of other cues (such as age, size, aggression, or dominance displays). (ii) Infants' representation of dominance relationships is sufficiently general to enable forming predictions across a variety of situations. (iii) Infants do not extend their expectations of dominance to unobserved relationships, possibly because they represent dominance as a social relationship between agents and not as individual characteristics.

B-030
Trajectory as an agency cue in dogs

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Infants can attribute agency based on various cues, for instance, specific motion characteristics, such as the efficiency of the trajectory in a goal-directed action (Gergely, et al., 1995). Although there is lot of research on how infants attribute agency, it is an open question whether other species use the same cues. To investigate this issue, we tested dogs in a forced choice design, in which we used two plush toys (T1 & T2) with different motion paths. Our hypothesis was that dogs will attribute agency based on motion cues, and will prefer the agent, because an agent is socially relevant to the dog. In the learning phase the dogs observed the motion of two toys that moved from location A to B. In the first 2 trials there was no obstacle between A and B, while in the next 8 trials we introduced an obstacle. When the obstacle was present T1 always made a detour around the obstacle, whilst T2 first always bumped into the obstacle, and then made a detour around the obstacle. In the test phase we let the dog choose between the toys. We found that dogs (n=20) significantly prefer T1 (the rational toy) over T2. Furthermore, we find no significant preference in a control condition (n=15), in which the toys trajectory was the same, however there was no obstacle present.

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