Poster Abstracts

Poster sessions are scheduled on Friday, October 26 and Saturday, October 27 from 6:00 pm to 7:30 pm. The abstracts for all posters submitted to CDS follow. In addition to the 180 posters that will be displayed on poster boards, we received 30 alternate submissions. Many of the alternate submitters will be displaying letter-size copies of their posters on tables in the poster session room.

On the following list of abstracts the session and location are indicated before the title of each poster. The session is noted with an "F" for Friday or "S" for Saturday and the location is noted by a number or "A" for Alternate Table.

Examples: F21: Friday poster session, poster #21
SA: Saturday poster session, alternate table

The poster abstracts are listed in alphabetical order by the last name of the first author.

Parent-Child Verbal Pretense And Its Relation To Socio-cognitive Development

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Examines the relationship of children's verbal pretense to theory-of-mind development. Is pretense a by-product of an underlying representational capacity, or is it a process through which children's understanding of the mind is expanded? 60 parent-child dyads from across the socio-cultural spectrum of Chicago area were observed for 90 minutes at home when children were 3½ years old. Their spontaneous interactions were transcribed and coded for instances of verbal pretense, including reference to imaginary objects or events, role substitution, etc. One year later, children's socio-cognitive development was assessed with a Theory-of-Mind Scale. Substantial variability was found in measures of pretense and in theory-of-mind performance at 4½ years. Co-variation between measures of pretense and theory-of-mind across developmental time is examined, as is the specific role of parental pretense participation in theory-of-mind development, as well as three-way relationships between pretense, theory-of-mind development and socio-cultural properties of the family environment.

Emotion and Mental-State Talk in School-Age Children's Frog Stories

Naomi Aldrich, Harriet Tenenbaum, Patricia J. Brooks
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To examine the development of talk about emotions and mental states, younger (N=43, 5/6-year-olds) and older (N=41, 7/8-year-olds) children generated narratives of two wordless picture books. Additionally, children completed a standardized test of emotion comprehension (TEC). Narratives were coded for labels and explanations of emotions and mental states. Preliminary analyses of emotion talk revealed that while both groups produced equivalent numbers of emotion labels in their narratives, older children produced more explanations, and achieved higher TEC scores than younger children. Numbers of word types and tokens correlated with amount of emotion labels and explanations, before and after controlling for age. Similarly, amount of talk correlated with TEC scores, with some correlations remaining significant after controlling for age. Surprisingly TEC scores were uncorrelated with emotion talk, suggesting a general link between language production on this measure of emotion understanding, as opposed to a specific link between emotion talk and understanding.

F38

Parent-child Interaction, Attachment, And Memory In Middle Childhood

Kristen Weede Alexander, Emily K. Newton, Karen Davis O'Hara, Rosemarie H. Kraft
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Memory develops in the context of ongoing parent-child interaction (PCI). Previous research has linked PCI to children's attachment security and to their memory for shared events. A consistent pattern of associations between PCI and memory for unshared events, however, has not yet emerged. In the present study, 8- to 12-year-old children encoded emotional pictures/stories and then interacted with a parent about the experimental stimuli. After one week, children were administered memory tests, and attachment was assessed in both parents and children. Results indicated that parents exerting greater control over the conversation were higher in attachment anxiety and had children who recognized fewer emotional pictures and recalled fewer stories high in relevance to parent-child relationships. Similarly, children who exercised greater autonomy during the interaction were more secure and recalled more high relationship-relevant stories. Findings will be discussed in relation to theories of children's memory development in the context of close relationships.

F36

Children Learning Physical Science: The Importance Of Making Invisible Processes Visible

Florencia K. Anggoro, Nancy L. Stein, Marc W. Hernandez
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Can children learn fundamental concepts of physics? What factors facilitate learning? We taught fourth-graders about states and state changes of water. Important concepts included matter and its molecular basis, speed and movement of molecules, heat energy and temperature, freezing and boiling, and shape and volume of water as it changes states. Several conclusions can be drawn. First, the conceptual structure and explicitness of ideas greatly influence learning. Second, the concrete nature of our causal sequence is readily accessible with enriched graphics. Third, children had little difficulty learning about molecule behavior and characteristics of different states. Concepts that presented difficulty were volume, area, and measurement, which can be mastered in second/third grade. Thus, the conceptual content of modules for teaching physics is the source of difficulty, not the students or their age. Children can learn these concepts at much younger ages, but existing modules need significant change to include explanatory coherence.

S37

Naming Practices Influence Children's Biological Induction

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We considered the effects of naming on children's biological induction. In English, the word 'animal' can be applied to two overlapping categories: one includes both humans and non-human animals (ANIMALinclusive); the other includes only non-human animals (ANIMALcontrastive). In Indonesian, 'animal' is only applied to non-human animals (ANIMALcontrastive). A category-based induction task revealed that at age 6, English-speaking children generalize to non-human animals about equally when the property is taught on a human (M=.48) or a non-human animal (dog M=.50; bird M=.51; bee M=.47), corresponding to ANIMALinclusive. In contrast, Indonesian-speaking children generalize to non-human animals less when the property is taught on a human (M=.29) than when it is taught on a non-human animal (dog M=.46; bird M=.46; bee M=.43), suggesting that non-human animals are considered more likely to share a property with each other than with humans (corresponding to ANIMALcontrastive). In sum, children's biological induction is influenced by naming practices.

F62

The Impact Of Parent Feedback On Children's Label Acquisition

Amber Ankowski, Catherine Sandhofer
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Research shows that parent corrections may influence children's acquisition of syntax (e.g. Chouinard & Clark, 2003). The present study investigated whether negative input in the form of explicit corrections of children's incorrect labels also helps children to acquire semantic information. This study observed twelve two-year-old children and their parents in eight naturalistic play sessions across six months. Following each play session children took comprehension tests for color, number, size and texture words. Play session transcripts were coded for children's correct and incorrect color, number, size and texture labels and parent responses to those utterances. Analysis of transcripts and comprehension test scores revealed that parent input had significant effects on children's label learning. While negative input did not predict children's learning of color, size, number, and texture terms, a significant relationship was found between parent use of positive feedback (e.g. 'yes', 'that's right') to children's correct label utterances and children's learning. The current study revealed that positive input may be more impactful to children's semantic acquisition than negative input.

S21

The Color Matching Task: A New Paradigm To Assess Mental-Attention

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We constructed two fMRI friendly color matching tasks (CMT-Balloon, CMT-Clown) to measure mental-attentional (M-) capacity - an endogenous executive-attention that grows developmentally in stage-wise manner. Both are modified updating tasks where current-and-preceding-figure colors are to be matched. In both tasks the mental-attentional demand (Md) of items is parametrically varied to generate all levels of Md. CMT-balloon is facilitating whereas CMT-Clown contains misleading features. As with other M-capacity measures, passing age for various classes of items should parametrically increase from one class to the next. Participants of M-capacity levels 3-7 (ages 7-14 years and adults; N= 149) were studied. The two tasks are highly correlated with the widely used M-capacity measure Figural-Intersections Task. Developmental profiles of the three tasks, class by class, are close and agree with theoretical M-level predictions. As predicted, each class of items in CMT-Clown had one more unit of difficulty (Md) than its corresponding class of CMT-Balloon.

Grumpy Old Men? Literal and Non-literal Representation of Emotion in Children's Drawings of an Old Person

Jennifer E. Baker, Saba Ayman-Nolley, R. Breckinridge Church, Michelle Morone, Emeline Ortiz, Sandra Valencia
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Examining children's drawings may be the best way to access a child's schema of an old person, as it eliminates many of the obstacles a researcher faces in understanding children's social cognition. Drawings from 71 students from sixth and eighth grade were employed to document literal and non-literal representation of emotion. When literal emotional indicators were present, they most often indicated happy emotion. Although the drawings exhibiting an old person with a happy face tended to include more colors, the use of non-literal means (such as color and line) seemed to be more related to creating realism than to creating representations of emotion. Though 59% of the children included emotion in their drawings, only 5% of the children included emotion in their text, indicating that the descriptive appearance of emotion in the child's schema of an old person may appear in drawings before it appears in written language.

S81

Preschoolers' Use Of Internal Features To Guide Knowledge Of Growth And Metamorphosis, Part 2

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During the preschool years, children begin to understand physical changes such as growth and metamorphosis (Gelman & Welman, 1991; Rosenberg et al., 1991). We taught 4-year-olds a novel property of a young animal and asked them whether this property was also true of an adult animal that had undergone growth or metamorphosis. In previous research we found that children attributed the novel property to the adult animal more often when the young animals' and adult animals' insides were visible and similar in appearance than when the insides were not visible. This pattern suggests that similar internal features are a basis for children's property generalizations. In the present research we tested alternative explanations for these results. We found that this effect was not due to the novelty of the animals' insides (Experiment 1), nor could it be reproduced by adding a similar feature elsewhere on the animal (Experiments 2 and 3).

F39

Understanding Of Films By Individuals With Autism Spectrum Conditions And Neurotypical Controls

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Autism is a neurodevelopmental condition marked by communication difficulties, narrow interests, repetitive behavior, and social deficits. Significantly, the way we understand the social world and the way we communicate have often been likened to the way we understand and produce narratives. For this reason, developmental researchers have examined differences in the way that children with and without autism spectrum conditions (ASC) understand and tell stories. Typically, these experiments use simple stimuli (ie a wordless picture book) to elicit narratives and then code the narratives for variables related to comprehension (e.g. theory of mind, gist of story) and production (e.g. use of causal language and proven storytelling techniques). In this experiment, we adapt the narrative elicitation paradigm to examine spontaneous understanding of socially complex film stimuli in adults with and without ASC. The potential uses of this test for social cognitive neuroscience research are discussed.

F53

10-month-old Infants Use Gaze Information To Locate A Hidden Social Partner

Jonathan Beier, Elizabeth S. Spelke
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Previous research has shown that 10-month-old infants are sensitive to the presence or absence of mutual gaze expressed between two people (Beier & Spelke, in prep). The present study investigates whether expectations for mutual gaze between social partners support inferences about the location of an unseen person. Infants viewed a centrally positioned actor turn to one side and have a brief conversation with someone who was heard but not seen. Following

the conversation, the actor was occluded and side panels on either side of her were removed, revealing a second person on one side and a toy truck on the other. 10-month-old infants looked significantly longer to displays where the truck appeared in the location of the central actor's prior gaze than the reverse. Informed by expectations for mutual gaze, infants predicted that an entity of a particular kind (eg, person versus inanimate) was hidden in a particular location.

S55

Eighteen To 24-month-old Monolingual Infants Easily Learn Labels For Familiar Objects In A Novel Language

Jui Bhagwat, Marianella Casasola
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Little is known about the role of social interaction in early second-language learning. Monolingual, English-learning, 18- to 24-month-old children were taught Spanish labels for familiar objects (e.g., a toy dog) by a native Spanish speaker, in an interactive setting. Children heard 4 to 6 repetitions of the label embedded in phrases such as "Mira, es un perro--que bonito el perro--te gusta el perro?" Equal attention was drawn to control objects (e.g., a toy car) using equivalent phrases without a label. Subsequently, in a preferential-looking paradigm, children looked significantly longer at the target object on hearing the label as compared to baseline looking times. In a second condition, comprehension of labels will be assessed after presenting children with video-taped events of the speaker playing with and labeling the objects. Results are expected to shed light on the relative importance of face-to-face interaction versus indirect exposure in learning a second language.

S78

The Nature of Israeli Children's Beliefs about Social Categories

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We examined to what extent Israeli children hold essentialist beliefs about various social categories relevant in their culture. Participants were kindergarteners, 2nd, and 6th graders, from three populations: secular Jews, religious Jews, and Arabs (N = 864). Different studies examined the power of social categories in guiding children's inferences, the extent to which children believe that one's membership in a social category is determined by one's biological parents and remains stable throughout development, and children's explicit essentialist beliefs about the categories "Jews" and "Arabs". Altogether, we found that while religious Jewish children were the most likely to draw inferences based on ethnicity (Jewish vs. Arab) – especially when categories were labeled – Arab children seemed to hold the strongest beliefs about the biological inheritance of ethnic membership. These findings manifest how children's concepts of social categories is influenced by how cultural groups both, value different social categories, and define social category membership.

S42

Very Young Children's Interest In Animals

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In two studies, we demonstrate a pronounced interest in animals by very young children. In Study 1, one- to three-year-olds participated in a highly naturalistic play session in a room containing toys and two live animals, a hamster and a fish. Nearly every child noticed and interacted with the animals and their interactions were highly distinct from those involving toys. In Study 2, 4- to 12-month-olds watched a video slideshow of pairs of moving animals (i.e., an elephant walking) and objects (i.e., a helicopter landing). The infants strongly preferred to look at the animals, overall looking nearly twice as long at the animals as the objects. Our results are the first to document a profound and perhaps intrinsic interest in living creatures by very young infants far too young to have had much, if any, experience with animals.

S9

Whose Memory Is This: Are Early Autobiographical Memories Really Family Stories?

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The repeated recounting of past events may not only affect the original representation of the memory, but also be related to children's developing sense of self. To examine this experimentally, 30 parents and their 4-year-olds kept a calendar of events for 4 months. Children were then interviewed about events randomly selected from the calendars, and half of those events were assigned to become "family stories." Over the next 12 months families talked about the "family stories" more often than the non-family-story events (Ms = 9.61 vs. 0.83 times). After 12 months, in free recall, children provided more information for the family stories than the non-family-stories (2.92 vs. 2.17 narrative elements). However, the total number of narrative elements provided (free plus prompted recall) was not strikingly different (5.25 vs. 5.58 narrative elements). Relations to children's developing self-concept, and their understanding of time and space, will also be examined.

S46

Memory Of Emotional Events In Relation To Attachment And Coping

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Memory can be explained through information processing theory, which consists of constructive processes influenced from past experience. Experience also develops childhood attachment systems. These systems become activated during the processing of emotional information. Consistent associations between attachment and coping utilization have been identified in middle childhood; but a consistent relation to processing emotional stimuli has not been found. In the present study parents and their 8- to 12-year-old children were assessed for attachment style; the children were also assessed for coping utilization. Children encoded emotional picture/stories and were asked to recall the picture/stories a week later. Results showed children's attachment security was related to their coping strategies. Furthermore, parental attachment, children's attachment, and children's coping strategies independently predicted children's memory for emotional stimuli. Results will be discussed regarding attachment theory and the influence parent's attachment and child coping utilization have on children's processing of emotional events.

FA

Animal and Artifact Differences in Generic Language Use: A Window onto a Conceptual Divide

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Generic noun phrases (e.g., Birds fly) refer to a category as an abstract whole. Generics express generalizations about shared properties of category members. Research has shown that children and adults commonly produce more generics about animals than artifacts. This may reflect fundamental differences in how these concepts are structured; however, this may instead reflect differences in participants' generic knowledge about specific animals and artifacts (e.g., dogs, chairs). To tease apart these conflicting hypotheses we presented adults and preschoolers with pictures of novel animals and artifacts (Experiment 1: Real yet unfamiliar animals/artifacts; Experiment 2: Matched pairs of novel animals/artifacts created to be as similar as possible across domain). Participants generated properties about each picture. Results reveal that even without prior knowledge, adults and preschoolers produce significantly more generics for novel animals than novel artifacts. These results bolster the claim that fundamental differences between animal and artifact concepts drive generic language use.

F10

Preschool Pathways To Science: Assessing And Fostering Scientific Reasoning In Preschoolers

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A training study explored preschoolers' understanding of variables and comparative tests. Intervention focused on asking 'find out' questions, designing comparative tests, and describing results. At pretest, children judged 6 scenarios to explore their awareness that the method of difference is needed to answer 'find out' questions (e.g., which kind of car is faster). Post-tests included: pretest scenarios; a picture prompt and interview to assess recall of an experiment completed during intervention; and designing a test to answer a novel 'find out' question. Preliminary results suggest that for the scenario judgment task, children maintained pretest performance levels, and a few improved dramatically. Gains were also found for explanations. The picture prompt and experimental design tasks seem to reveal knowledge not necessarily uncovered by the judgment task. Our work informs descriptions of learning trajectories and the design of educational experiences that support growth towards more complex understandings.

S43

How Children's Evaluations Are Influenced By An Individual's Past Accuracy

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Preschool children are sensitive to an individual's history of accuracy, which they use as a cue to potential reliability when deciding whom to learn from. We are investigating the extent to which children use history of accuracy in a range of contexts. First, we are assessing whether a speaker's past accuracy will influence children's decisions regarding who is most knowledgeable in a context where one individual has visual access to crucial information that the other individual cannot see. Second, we are examining whether children attribute accuracy as a trait, and if that 'trait' will influence subsequent attributions of knowledge, personality characteristics, and abilities. Preliminary findings suggest that an individual's past reliability in a single domain does influence children's attributions of broader traits and abilities.

S60

Encoding Detail Versus Meaning: Does The Focus Differentially Affect Children's Source-monitoring Performance?

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Children 5- to 8-years old encoded either visual details, or meaning, or were simply told to look carefully (control group) at simple line drawings framed by red or green borders. Recognition and source memory was later tested. Feature-binding ability was also measured. Younger children were expected to show improved source memory when encoding verbatim details, whereas encoding themes was expected to benefit older children. Feature-binding ability was expected to correlate with source performance for both age groups. Children 5-years of age benefited more when they focused on details in the picture, relative to the control group. Children 8-years old who were able to bind together picture and location in feature-binding were also more likely to independently encode thematic picture information and monitor the source of the picture. Results will be discussed in terms of Fuzzy-Trace Theory (Brainerd & Reyna, 2004) and the Source-Monitoring Framework (Johnson, Hashtroudi, & Lindsay, 1993).

S29

Picture Book Reading With Toddlers: Exploring Changes In Maternal Support Over Time

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The present research examines longitudinally changes in maternal language use during book reading with children between the ages of 13 and 36 months. Thirty mothers were observed as they shared wordless picture books with their children (15 girls) when their children were 13, 18, 24, 30, and 36 months of age. Of particular interest were the amount and type of structure and content that parents provided, including types of questions, labels, descriptions, and inferences. In addition to examining changes in maternal speech related to increases in children's age, we will also examine whether characteristics of maternal speech are related to children's language ability as assessed by the MacArthur-Bates Communicative Development Inventory. This research addresses how levels of cognitive demand increase with age and whether levels of cognitive demand and support provided by mothers are related to children's language skills.

SA

The Role of Social Cognition in Mathematics Problem-Solving in Low- and Middle-SES Children

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This research rejects the predominant "deficit model" of low-income children's cognition and, instead, promotes a "strengths-based" view. In an effort to reduce the achievement gap in mathematical problem-solving, this work seeks to capitalize on low-SES children's strength in social reasoning. Such social-cognitive strength is routed in the unique socialization experiences of low-income children and has been revealed in recent studies of "theory of mind" development. The purpose of this study is to investigate whether low-SES children's strength in social cognition can be recruited to improve learning in the domain of mathematical problem-solving when math problems are presented in a socially-based story context.

An additional goal is to examine the relation between children's self-efficacy and mathematical problem-solving capabilities. Perhaps curriculum that recruits low-SES children's "cognitive capital" (social reasoning) by embedding mathematics in a social context could improve the mathematics self-efficacy of these students, and subsequently, lead to better academic performance.

S33

Preschoolers Do Not Take A 'Teleological Stance' In The Action Prediction Of Moving Shapes

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The present experiments tested assumptions of the teleological model proposed by Csibra & Gergely (1998) with preschoolers. In Experiment 1, children viewed animations of a ball moving over a rectangle or over nothing in route to an unambiguous goal (to the triangle) or ambiguous goal (away from the triangle). The rectangle was then removed, and the child was asked to predict what the ball would do in this new situation. In Experiment 2, the rectangle was included in the test scene such that children had to choose between moving towards the triangle or the rectangle. There were 3 dependent measures: Verbal response, Forced-choice, and Action Trajectory produced. It was predicted if children were using a teleological representation they would choose a location consistent with the goal previously viewed, and produce "rational" (efficient) trajectories. Results were inconsistent with these predictions.

F34

Will The Mouse Always Go Into The House? A Closer Look At 18-month-olds' Abilities To Copy Action Goals

Erin N. Cannon, Amanda L. Woodward, Malissa Durham
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Carpenter, Call, & Tomasello (2005) found 18-month olds imitated action differentially, depending on context. When infants observed an experimenter hop or slide a toy mouse into one of two houses, they subsequently put the mouse directly into the house, ignoring the means. When infants observed the same action on a mat without houses, they were more likely to imitate the observed action. The authors concluded in the former condition, the house was viewed as the experimenter's goal, whereas in the latter condition, the action itself was viewed as goal. Here, we question the specificity of the goals being encoded in this task. First, we replicated the original study with 18-month-olds. In a second study, we showed infants the same actions on a mat with a house to one side, and nothing on the other side. Our findings were consistent with Carpenter et al., but provide a better comparison between conditions.

S38

Cross-Linguistic Effects On The Development Of The Shape Bias: A Comparison Of Spanish- And English-Speaking Children

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Previous research has indicated that children and adults extend novel count nouns on the basis of shape. The shape bias is thought to emerge as a result of regularities in the linguistic input. In English, count nouns are introduced with a common set of modifiers (e.g., one, a) that, with experience, guide attention to shape. In contrast, Spanish does not differentiate between instances of solid object, color, or texture references. Because Spanish does not provide clear linguistic markers of count nouns, we predicted that the shape bias would develop later in Spanish-speaking children. English-speakers (n=39) and Spanish-speakers (n=29) at 24, 30, and 36 months were given a standard shape bias task. As predicted, English-speakers selected same-shaped objects more frequently than Spanish-speakers at all ages. Further, although there were no differences in overall productive vocabulary, 24-month-old English-speakers produced more shape-based nouns than Spanish-speakers at the same age.

S44

Encouraging Young Scientists: Parent-Child Interactions At An Informal Science Education Center

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Waning interest in science among middle- and high school students remains a national concern (NSF Science and Engineering Indicators, 2006). While efforts to strengthen formal K-12 science education are making strides, a growing body of research highlights the importance of out of school experiences for sparking children's early interest in science. Informal Science Education Centers create and contribute to public engagement with science through hands-on activities and interactive exhibits. Our research is addressed to documenting the nature of parent-child interactions in a science education center housed in an active gravitational-wave observatory. Parent-child dyads answered questions about their attitudes, interests, and knowledge of science and were observed as they engaged with interactive exhibits.

F8

"Mice Can't Really Dance": Reducing The Positivity Bias In Children's Fantasy-Reality Distinctions

Nathalie Carrick, Alexandra Harris, Jodi Quas
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Previous research suggests that emotion can influence children's fantasy-reality distinctions. Specifically, children tend to report that positive fantastic and real events can occur in real life and negative fantastic and real events cannot occur (Carrick & Quas, 2006). This study examined whether children's ability to discern fantasy and reality would improve when a consequence was imposed on their judgments. 3- to 5-year-olds viewed two series of images that depicted emotional fantastic and real events, reported whether each event could occur, and rated how each image made them feel. During the first series of images, children's fantasy-reality distinctions were not corrected; however during the second series, children were told that they would receive a prize if they correctly judged the images. Results reveal general increases in children's performance when a consequence was imposed on their judgments. Findings have implications for children's understanding of fantasy and how emotion influences cognitive development.

F79

The Relationship Between Behaviour And Perspective Taking In Children

Tracy Cassels, Susan Birch
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The ability to identify other people's mental states, such as thoughts, feelings, desires, and intentions, is essential for social development as it allows us to understand, predict, and respond to other people's

actions. Over the past few decades, plenty of research has focused on the typical development of these skills in children (e.g. Birch & Bernstein, in press; Moses & Chandler, 1992), but little has focused on the atypical development of these abilities (with the one exception: a large body of literature focusing on atypical social perspective-taking in individuals with autism and forms of autistic spectrum disorder; see Baron-Cohen, 2000 for a review). This research examines the relationship between the ability to identify other people's mental states and the frequency of antisocial behaviour, on one hand, and levels of empathy, on another, in 6-9 year old children.

S76

Beyond The Scaffolds: English- And Mandarin-learning Infants' Mapping Of Novel Words To Agents, Actions, And Objects

Cheri Chan, Jie Chen, Rachel Pulverman, Twila Tardif, Xiangzhi Meng
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Research shows that English learners typically have early vocabularies dominated by nouns (agent and object words). Interestingly, data from naturalistic observations and the MacArthur-Bates Communicative Development Inventory (MCDI) have converged to show that Mandarin learners acquire relatively more verbs (primarily action words) at an earlier time in development. Yet, naturalistic sampling and MCDI interviews alone, being susceptible to cross-cultural variations in caregiver characteristics, cannot produce a complete picture. The current study presented US and Beijing 14- and 18-month-olds with controlled and identical word learning conditions, to explore whether differences persisted in when English- and Mandarin-learning infants mapped novel words to agents, actions, and objects. Preliminary data reveal surprising differences in the learning of agent words across the two linguistic environments. Results also suggest that cross-cultural patterns observed in noun and verb acquisition did not arise exclusively from scaffolding and caregiver characteristics, and likely reflected biases internalized in the learners themselves.

F47

Reacting As The Future Unfolds: Cognitive Control In Children

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Children are often said to have little regard for the future consequences of their actions. Cognitive control of their behavior may therefore take a more reactive form, in which children do not proactively prepare for the future but merely react to it as it unfolds. The current study examines how reactive control may manifest in a child-adapted version of the AX-CPT task. Pupillometry and eye gaze data, as well as overt behavioral measures, tentatively suggest that differences in reactive control may underlie AX-CPT performance. Possible links to working memory and task-switching performance will also be described.

F67

Declarative Memory And Cardiac Evidence Of Attention: Implications For Age-related Changes In Attention.

Carol L. Cheatham, John Colombo
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Toward the end of the first year declarative memory and endogenous attention develop. It is not known how these two abilities map onto one another. Twelve-month-olds were tested with four 2-step events in an elicited imitation paradigm. Electrocardiogram data were collected. Groups were determined by evidence of ordered recall of the two steps. Second by second heartrate from the demonstration period was modeled as a polynomial function of time. Results indicate that the heartrates of participants who subsequently recalled the sequence in the correct order did not decrease across time as rapidly as the non-recallers' heartrates, $Fs(2,29)=16.47\text{-}28.59$, $ps<.0001$. In addition, the quadratic term indicated recallers' heartrates entered the termination phase of attention sooner than those of non-recallers, $Fs(2,29)=4.00\text{-}15.71$, $ps < .05$. Heartrate-defined phases of attention as they relate to the ability to recall declarative information are discussed.

F48

Toy Story: Toys That Promote Play Complexity

Isabelle Cherney, Jessica Dempsey, Lynsey Rangel
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Play complexity is an area of psychology that has received little empirical research, yet play is at the center of children's early life. Cherney and her colleagues (2003) found that female gender-stereotyped toys elicited higher play complexity in both sexes. The current study examined three- to five-year-old children's play with 10 gender-neutral and gender-ambiguous toys in a traveling playroom setting. Children were invited to play with any of the toys for approximately 10 minutes and were then asked whether each toy was a "boy toy" or a "girl toy" and why. Play was coded for its complexity across the different types of toys. Preliminary findings will be discussed in terms of which types of toys elicited the most complex behavior and how children reasoned about the gender of neutral and ambiguous toys. The behaviors and verbalizations will be interpreted in terms of gender development, schema, preferences, and attitudes.

F71

Toys "R" Me: Children's Reasoning About Sex-typed Toys

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Children's toy preferences are sex-typed and influence their memory, attitudes, and behaviors. These sex-typed preferences may be based on gender roles or schemas acquired through socialization. It is unclear, however, how children reason about and behave with ambiguous toys. The present study examined the reasoning and behaviors of three- to five-year-old boys' and girls' interactions with sex-typed and ambiguous toys either alone or with a same-sex or other-sex peer. Preliminary results showed that older children and boys held stronger gender stereotype preferences than younger children and girls. Same-sex dyads lead to more stereotyped play and toy preferences than other-sex dyads. Play complexity was higher when children played alone than when they played with peers. Their reasoning about toys was influenced by their desire to play with the toys and whether or not they had previously played with a toy that was considered of the opposite sex or ambiguous.

F29

Preschool 'Pollyannas'? Limited Influence Of Negative Information On Young Children's Personality Judgments

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The present study investigated 3- to 6-year-olds' use of behavioral consistency and intention information to make personality judgments about a story actor. Participants were told about an actor who behaved negatively toward a recipient once or several times, either intentionally or unintentionally. Participants were asked to make behavioral predictions and trait attributions about the actor. Findings indicated that, with age, children required fewer behavioral exemplars to make negative behavioral predictions. Intention information did not affect participants' behavioral predictions, but influenced their trait attributions such that children were more likely to label a character as 'mean' when behaviors were performed intentionally than unintentionally, regardless of the number of behavioral exemplars. Despite the presentation of negative information, the majority of children rated the actor positively, consistent with previous findings of a positivity bias in impression formation in early childhood. Findings are discussed with reference to children's emerging understanding of personality.

F58

Learning Novel Relations Via Comparison

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Two experiments tested the role of comparison in the development of relational thought. To test whether comparison promotes relational focus by highlighting common relations, novel relations were used. In Experiment 1 three- to five-year-old children were shown a standard containing a novel relation labeled with a novel noun. Children were asked to extend the label either to a match containing the same object or to a match containing the same relation. The results showed that children who had viewed two standards simultaneously and were encouraged to compare showed a greater preference for relational matches than those who had viewed the standard alone. To further test whether this relational responding result was driven by a comparison mechanism, in Experiment 2 we presented children with two standards sequentially. In contrast to Experiment 1, we found a preference for object matches over relational matches.

The impact of gesture on memory for vocabulary

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When people talk, they frequently gesture. Research demonstrates that when gesture accompanies new information in speech, that information is acquired easily and is retained over time. However, much of the research that examines gesture's role in learning and memory has been done with respect to math and science concepts. This poster summarizes two studies that show that gesture can be used as a device to aid in the learning and retention of new general vocabulary. Both studies use a pretest-intervention-posttest design to examine the learning of new words and their definitions. Study 1 examined children and adults learning unfamiliar words with and without prescribed gestures created by the researchers. The second study examined adults learning unfamiliar words with and without gestures created by the participants. We found that participants who used a gesture device to remember new words recalled more words in the posttest than those who used alternative memory devices.

S45

Robots, People, And Tables: The Role Of Appearance In Infants' Generalizations Of Goal-directed Action

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Much recent evidence has demonstrated that infants attribute goal-directedness to objects on the basis of their behavioral and motion cues, but little is known about how goal-directedness is generalized on the basis of appearance. A series of experiments used an imitation-based adaptation of the Woodward (1998) paradigm to investigate if 14- through 26-month-olds attribute goal-directedness to a range of entities. In the task, infants saw an experimenter move a scale model toy towards one of two objects. The scale model toys included animals and inanimate objects with and without legs, people, and robots. Afterwards the location of the objects were switched and infants were then encouraged to imitate the action of the experimenter with the same model toy. Results revealed that, in the absence of behavioral cues to animacy, infants generalized goal-directedness to entities with legs through 26 months of age. Furthermore, attributions were influenced by the perceptual similarity of the entities to humans. These findings suggest that object appearances play a critical role in determining to which entities infants generalize goal-directedness.

SA

Information Conveyed in Generic Sentences becomes Central to Preschoolers' Concepts: Evidence from their Explanations

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We tested the hypothesis that novel properties conveyed in generic sentences (e.g., "Spiders catch hexapods") are viewed as more central to the structure of a category (e.g., spiders) than the same properties conveyed in non-generic sentences (e.g., "This spider catches hexapods"). Four-year-old children were asked to explain novel properties provided in generic and non-generic sentences, as well as familiar properties in both forms (e.g., "Spiders catch flies" and "This spider catches flies"). These explanations were coded on two distinct dimensions: content (i.e., whether the explanation refers to a function, a prototypical feature, an idiosyncratic feature, etc., regardless of the scope of this fact) and category-reference (i.e., whether or not the explanation relies on a fact about spiders as a category, regardless of the content of the fact). In line with our hypothesis, children consistently distinguished between the novel properties provided in generic form and those provided in non-generic form on both these dimensions, explaining the properties in generic form with more functional features, fewer idiosyncratic or situation-specific features, and more category-wide facts. Moreover, children's explanations for novel properties in generic sentences were overall similar to their explanations for the familiar, central properties. These findings illustrate the power of generic language to shape children's concepts.

F13
Vous Comprenez? Influence Of Language On Preschool Children's Processing Speed

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The current research focuses on bilingual (Francophone/English) and monolingual (English) preschool children's executive functioning abilities, specifically focusing on cognitive flexibility. Cognitive flexibility, also referred to as set switching, is the ability to flexibly switch between rules. 30 3-year olds and 30 4-year olds (equal bilingual and monolingual groups) were given a variety of executive functioning measures, including the FIST, DCCS, Day-Night Stroop, Blue-Red Dog, and Bear-Dragon, as well as language measures to assess proficiency in receptive language(s). Reaction times were recorded for 4 executive functioning measures. Results will focus on accuracy differences as well as processing speed differences, both between age groups (3-year olds vs. 4-year olds) and language groups (bilingual vs. monolingual).

F9
Where Does It Go Awry? Predicting Age-related Differences In Long-term Recall

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We used elicited imitation of 6-step sequences to examine the predictive utility of measures of encoding and consolidation for long-term recall in 3-, 4-, and 5-year-old children (n = 54). Probes of the memory trace immediately after experience and 1 week later served as the measures of encoding and the success of consolidation respectively. To provide the most sensitive measures of encoding and consolidation across ages, temporal connectivity (number of enabling relations) of the sequences was varied. Participants were exposed to one sequence at each of high, medium, and low connectivity levels. The immediate and 1-week delay probes allowed us to explore the possibility that individual and/or age-related variability in performance at these two points in the life of a memory will provide a window of prediction on age-related differences in the robustness of the memory trace 5 weeks later. Preliminary analyses are consistent with our hypotheses.

F66
The Impact Of Teachers' Memory-Relevant Conversations On Children's Memory Development

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In a longitudinal study, 107 children were followed across the first and second grades, focusing on multiple assessments of mnemonic competence and coded observations of instruction in their classrooms. Children's changing deliberate memory skills were associated with aspects of their teachers' 'mnemonic orientation' as reflected in their memory-relevant language during ongoing instruction. The children in first-grade classes that were taught by 'high mnemonic' teachers sorted in an organized fashion more than those taught by 'low mnemonic' teachers. This effect was apparent by the middle of the first grade and extended through the end of the second grade. In addition, the mnemonic orientation of second grade teachers had less of an influence on their students' performance, suggesting a sustained impact of first-grade context, even when children were taught by other teachers. These and other findings illustrate the importance of the classroom context for the socialization of children's memory.

F1
The Difficulties Of Representing Continuous Extent In Infancy: Using Number Is Just Easier

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We investigated the ability of 6-month old infants to attend to the continuous properties of a set of discrete entities. Infants were habituated to dot arrays that were constant in cumulative surface area yet varied in number for small (< 4) or large (> 3) sets. Results revealed infants detected a four-fold (but not three-fold) change in area, regardless of set-size. These results are in marked contrast to demonstrations that infants of the same age successfully discriminate a two or three-fold change in number, providing strong counter-evidence to the claim that infants use solely non-numerical, continuous extent variables when discriminating sets (Mix et al., 2002b). These findings also shed light on the processes involved in tracking continuous variables in infants.

F41
The Role Of Language In Infants' Understanding Of Others' Preferences

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Adults recognize that preferences drive consistent pursuit of objects across contexts. We investigated 9.5-month-old infants' ability to generalize object goals by examining infants' looking behavior in response to events in which an actor consistently pursued a target object in one room, then pursued that same object, or a different object, in another room. The presence of language utterances in the experimental context, and preexisting individual differences in infants' own language abilities, predicted infants' ability to anticipate the actor's consistent pursuit of the target object in the first context, and infants' novelty response to events in which the actor acted toward a different object in the second context. These findings suggest that language may play an important role in the emergence of preference knowledge by enabling infants to bind actor to object and generalize this relation across contexts.

S47
Scientific Reasoning In An Oral Health Context

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We present a study investigating the impact of evidence plausibility on scientific reasoning within an oral health context. 144 children aged 3-11 were given a task in which they had to identify which causal variables should be changed in order to test a stated hypothesis. Half the participants were presented with information that was consistent with their own beliefs, and half were given information that was inconsistent with their beliefs. Each child was presented with two scenarios, one in which the outcome was good (healthy teeth) and one in which the outcome was bad (unhealthy teeth). The results suggest that both outcome and the plausibility of the evidence with respect to prior knowledge affect the strategies children use in hypothesis-testing, regardless of age. These findings demonstrate that context and knowledge play an important role in children's reasoning.

S51

Children's Deontic Reasoning: Effects Of Context And Language

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There is an assumption that children are better at deontic reasoning (i.e., reasoning about prescriptive rules) than epistemic reasoning (i.e., reasoning about descriptive statements). However, only two empirical studies have examined this 'deontic advantage' in preschoolers, and both confounded situational context (e.g., the presence of an authority figure) with deontic language (e.g., 'must'), making it impossible to know which plays a greater role in children's reasoning. The current research teases apart this issue. Three-, 4-, and 5-year-old children (N = 96, mean age = 53 months) were assigned to either the deontic-authority, deontic-no-authority, epistemic-authority, or epistemic-no-authority condition. Four- and 5-year-olds showed no evidence of either a 'deontic advantage' or an 'authority advantage'. However, 3-year-olds showed evidence of an 'authority advantage', but not a 'deontic advantage'. This suggests that, for 3-year-olds, successful reasoning about rules and statements is reliant on the presence of an authority figure, not on deontic language.

S85

Monolingual and Bilingual Children's Use of the Shape Bias: The Role of The Object's Shape in Children's Use of the Bias

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The shape bias refers to children's tendency to label objects on the basis of the shape of the object as opposed to the color, size, or texture of the object. Recent research has shown that the shape bias may be a function of the linguistic input provided to the children or is used in the absence of reliable function information. The present research is exploring the role the actual shape of the object presented has on monolingual and bilingual (Spanish-English speaking) children. Three types of shapes are being used, letter-like shapes, traditional shapes (e.g., triangle), and nontraditional blob shapes.

SA

Preschool Children Learn Facts (and Sometimes Pictograms) Faster Than Words

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Are children faster and more accurate to learn words than to learn other kinds of information? We tested 3- to 5-year-olds' fast-mapping and taxonomic bias for novel words, facts, and pictograms. Comprehension, production, and generalization were tested after 1-4 exposures. In Study 1 children learned facts faster and produced and generalized them better than words. Children learned and generalized pictograms as well or better than words. Study 2 tested memory and relearning over a 1-week delay. Children initially learned facts better than words, and showed equal learning one week later. Pictograms were initially learned as well as words but were retained less over a week. Words, facts and pictograms were generalized equally. The results suggest children lack specialized word learning processes, but might show more savings in relearning words over several days, especially compared to pictograms.

F64

Neurodevelopmental Correlates Of Recollection And Familiarity: An FMRI Study

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Recent behavioral studies indicate a developmental dissociation between recollection (retrieval of qualitative features associated with the context of a target event) and familiarity (a general sense that the event occurred in the absence of contextual features): recollection develops until adulthood, whereas familiarity stabilizes during childhood. The neural mechanisms underlying this dissociation remain largely unknown. Sixty-eight individuals (8-year-olds, 10-11-year-olds, 14-year-olds, and adults) participated in an fMRI study. During fMRI data acquisition, participants incidentally encoded 200 drawings by performing semantic judgments. After the scanning session, participants completed self-paced old/new and source recognition tests on studied and new drawings. Behavioral results confirm age-related improvements in recollection, but not in familiarity. Imaging results suggest that activity in the left hippocampus and posterior parahippocampal gyrus is specifically associated with subsequent recollection in adults; this specialized recruitment is not as evident in children. Across age groups, activation in the perirhinal cortex is associated with subsequent familiarity.

S52

Probability Judgments In 11-month-old Infants

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We asked whether 11-month-old infants are able to reason about samples and populations using a violation-of-expectation looking-time procedure. Two conditions were included: 1) The random sampling condition: The experimenter closed her eyes and drew out, on alternating trials, either 5 red balls or 5 five white balls from an opaque box. She then opened the box to reveal a box containing mostly red balls. 2) The non-random sampling condition: The experimenter first conveyed a color preference to the infants, e.g., she likes white ones, by picking out the white balls from a set of red and white balls. The rest of the procedure was identical to the random sampling condition, except that the experimenter looked inside the box while sampling. Preliminary results suggest that infants are sensitive to the sampling condition: they look longer at the unexpected outcome according to either proportions or expressed preference in the corresponding conditions.

Effects of Social Context on Television Viewing Behavior and Recall of 3- to 5-Year-Olds

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Despite much research regarding effects of television on children as well as advice from parenting literature for parents to watch TV with children, the effects of social context on preschooler's cognitive processing of television are largely unknown. This study was designed to determine (1) how preschool-aged children behave while watching television alone, with a peer, with an older sibling, and with a parent, (2) whether preschoolers recall different amounts of information based on these viewing conditions, (3) whether preschoolers understand more or less of what they have seen based on these viewing conditions, (4) whether parents' behavior while watching television with their children is aimed at helping them understand and learn from television, and (5) how older siblings

behave while watching with preschoolers. Preliminary results suggest that despite many parents not discussing programs while viewing with their preschoolers, preschoolers who watched with their parents showed higher recall than those who watched alone

F63

The Impact Of Labeling On 10-month-olds' Expectations About Internal Object Properties

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In this study, 10-month-olds' expectations regarding object appearance and internal object properties are examined. Infants are presented objects (either two identical or two different objects) demonstrated to make either identical sounds or different sounds. At test, objects are labeled with either one repeated label or two distinct labels. Will infants' expectations about the noises the objects will make (two identical vs. two different sounds) be driven by the number of distinct labels applied to the objects, as opposed to the objects' appearance. If labels reference kind, infants should expect the internal properties of the objects (properties determined by kind membership) to accord with the objects' label. Thus, regardless of appearance, if the babies hear the objects' labeled with the same label, they should expect that the objects will make the same sound. The opposite pattern should hold if the infants hear the objects being labeled with two distinct labels.

S28

Demonstration of Infant Decision Making in the A-not-B Paradigm with an Autonomous Robot

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Dynamical Field Theory views infant behavior in the A-not-B task as a decision making process that is governed on-line by the current task setting and by the infant's behavioral history. We demonstrate this on an autonomous Robot that is linked to the environment in a closed loop by means of a video camera and two motorized wheels. A series of A-not-B experiments are replicated with the robot. Variations of the cues demonstrate how the context integrates into the decision making process, sometimes indirectly by influencing the behavioral history. Variations to the delay in combination with the cooperativity in the field demonstrate how stronger cooperativity allows to maintain activation of previous events, thus increasing the ability to remember a cue. This internal change to the motor planning dynamics may help understand infants' developmental trajectory toward correct responding after increasingly longer delays.

Children's use of gaze direction to indicate what another person wants and does not want

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Previous work has shown that preschoolers can use gaze direction to infer another person's desired object (e.g. Baron-Cohen et al., 1995). However, children may simply be following the agent's eye direction like a pointer that leads them to identify the correct object, without necessarily making any mentalistic inference. The current study modified the original paradigm to test whether 4-year-olds could themselves provide the gaze cue to link an agent to her stated desired target. Findings revealed that the majority of 4-year-olds were able to reliably pick the eye-gaze display that showed the protagonist looking at the object she wanted, as opposed to any of the other distractor objects. Moreover, when informed about what the protagonist did not want, children consistently chose the gaze display that showed her looking away from that object, suggesting that at this age they understand how gaze functions in both approach and avoidance contexts.

Is a False Belief Better Than None?

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We tested the "perceptual access hypothesis" offered by Fabricius and colleagues (e.g., Fabricius & Khalil, 2003), which states that the traditional tests of false belief allow children to pass who do not understand false belief, but who only reason that an ignorant person will be wrong. The hypothesis predicts that young children should respond similarly to false belief tasks and corresponding "no-belief" tasks. Results showed that 4-year-olds who passed the false belief tasks also chose the "wrong" alternative on the "no-belief" tasks, and furthermore were equally confident in their choices in the two types of tasks. These results are consistent with the perceptual access hypothesis, and suggest that young children do not initially pass the traditional false belief tasks by using the information provided in the tasks about the content of the character's belief.

S8

Memorial Consequences Of Multiple-choice Testing In 1st And 3rd Graders

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As recent policy has increased the frequency with which school-aged children are tested, the need to understand testing and its effects has grown. Research with adults has shown that taking a multiple-choice test has both positive and negative effects. Participants who have been previously tested on the material answer more questions correctly on a final test, but they also are more likely to incorrectly answer with multiple-choice lures. The current experiment examines both the positive and negative effects of testing in 1st and 3rd graders. The children first took a multiple-choice general knowledge test. They then took a cued recall test that included new questions as well as some of the questions that had been tested previously. Preliminary data shows that both age groups show large benefits from previous testing, but they also show an increase in the production of lures from the multiple-choice test.

F78

How Parents And Infants Engage In Joint Video Watching

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There is currently little research examining the effects of television on infants and toddlers. Videos and DVDs created specifically for infants and toddlers have become a part of many families' lives, however, not much is known about if or how parents interact with their children while watching videos. This study was designed to examine the relationship between 12- to 24-month-old infants' viewing of a Baby Einstein DVD and outcomes such as learning and language development. In this poster, we discuss findings related to parent-child viewing by examining both parental reports of DVD watching at home and videos of parents watching with children in the laboratory. We will present learning outcomes and how they may correlate with several aspects of parent-child joint watching,

such as frequency of watching, parent-child proximity, and the degree to which parents direct attention, label, and provide connections to prior shared experiences.

S84

Infants' expectations about solid and non-solid substances

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Five-month-old infants were tested in a violation-of-expectation paradigm to examine their expectations about solid and non-solid substances. Half of the infants were habituated to a colored liquid being tilted inside a clear glass cup. The other infants were habituated to a perceptually identical display except the contents of the cup were solid. In test trials, both habituation groups saw alternating events consisting of blue liquid poured back and forth between two cups or a perceptually similar solid blue chunk poured between two cups. Results show that infants look significantly longer at the novel test display. Specifically, the infants habituated to the solid object looked longer at the liquid test trials and the infants habituated to the liquid looked longer at the solid object test trials. These findings suggest that 5-month-old infants have different expectations for how solid and non-solid substances behave.

F33

Emerging Narrative Skills In Typically Developing Children And Children With Early Brain Injury

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Existing research indicates that children with pre- or perinatal lesions (PL) show plasticity for early language skills, although their performance may decline as the tasks become increasingly complex. We compared narrative skills in typically developing (TD) and PL children at 5 years of age, when these skills are just emerging. Stories were presented to children in multiple formats (wordless cartoons, audiovisual storyteller, and audio storyteller). In general, children told more complex stories and recalled more story events when the story was presented in audiovisual format compared to audio alone. Although the TD and PL groups did not differ significantly on complex narrative measures (comprehension, story structure, events recalled), the PL group produced fewer word types, tokens and (iconic) gestures. Thus, pre- or perinatal lesions may have an impact on the stories children tell, and we suspect that more differences will emerge when the children begin to tell more complex narratives.

F15

Infant Manual Exploration Of Composite Substrates

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Everyday environments vary dramatically in terms of material composition. Adaptation of manual behavior to such transitions is an important element of skilled action. To investigate the origins of this ability, we presented eight- (N=24) and ten-month-old (N= 24) infants hard or soft objects on a composite tabletop substrate that was half rigid and half flexible. Results indicated infants explored the objects selectively and geared their manual behaviors to the substrate they contacted. Specifically, infant object exploration was differentiated according to the rigidity of the object. Additionally, infants explored the two substrates differently, with and without an object in hand. Collectively, the findings suggest that by eight months, infants have already begun to act on the world in an adaptive fashion. Such flexibility may support early attempts at problem solving and tool use when objects need to be related to specific parts of substrates to accomplish desired ends.

F32

Preschool Children's Preferences For Explanatory Detail

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Examining adult-child conversation can reveal the underlying processes of children's knowledge seeking and theory-building. We investigate this topic using a novel methodology to examine children's reactions to different types of explanations within a conversational context. Our previous work, using the same methodology, showed that children prefer explanations over non-explanatory answers. Preschool participants received a set of question-provoking stimuli (e.g., a box of crayons that are all one color) and an adult responded to the child's inquiries with explanations varying in detail. We examined children's responses as an indicator of their relative satisfaction with the different explanations. Results provide information about whether children prefer shallower versus deeper explanations (Mills and Keil, 2004), have an optimal level of detail for an explanatory answer, and pursue this level of detail within adult-child conversations.

S22

Informal Museum Learning: Analyzing The Use Of Evolutionary Terms In Parent-Child Conversations

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Conversations between children and parents in museum settings shape the learning process differently than in structured settings. Here, children use inquiry-based learning while parents scaffold children's learning by providing explanations in conversational speech and by reading exhibit text. In this study, parent-child conversation is recorded in a naturalistic visit to a museum exhibition that showcased cutting-edge studies on biological evolution. We examined the extent to which this exhibition promoted evolutionary/scientific and novice explanations within parent-child conversations. We also investigated which of the species featured in the exhibit promoted the most evolution-centered conversation. Ten parent-child pairs, with 7- to 10-year-olds, were recruited. Their visits were videotaped, transcribed, coded, and descriptively analyzed. Results demonstrated a wide range of evolutionary and novice reasoning patterns (Evans, 2005). Although, the seven organisms elicited different evolutionary concepts, the exhibition as a whole elicited the core concepts necessary for understanding Darwinian evolution: Variation, inheritance, selection, time.

Do Nonverbal Cues "Say" Anything About Children's Social Understanding?

Maria Fusaro, Paul L. Harris
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This poster will consider whether a "rich" or "lean" interpretation should be made of young children's use of nonverbal cues, specifically of head nodding and shaking. That is, when a child correctly infers the meaning of a nonverbal signal, does that success suggest that she understands something about the signaler's mental state or attitude (rich interpretation)? Or, is the child using more basic memory and attention processes to infer or deduce the meaning of the cue (lean interpretation)? This poster will include discussion of how two opposing theoretical frameworks can account for findings from a completed study of 4-year-old children, and make predictions about a proposed study of 2-year-olds. This dialogue may shed new light on whether communicative signals are processed with domain general or domain specific mechanisms, during early childhood.

F55

Teaching The Physics Of Molecular States To Fourth Grade English Language Learners

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Fourth grade ELL students were taught about different states of water, in terms of the observable and molecular dimensions of a solid, liquid, and gas. Children were instructed in either English or Spanish. Learning modules were formulated according to a theory of explanatory coherence and concept acquisition. We assessed children's understanding by spontaneous verbal responses, probed questions, and picture drawings. The results showed that the majority of children, independent of input, understood not only the observable properties, but also the molecular properties of water. Although some of the concepts were only partially verbalized, children's picture drawings showed that the majority had comprehended and understood the different molecular properties of the three states of water. The ability to verbalize the visual representations was significantly related to vocabulary, whether assessed in English or Spanish. Further, understanding was significantly related to understanding the nature of perceptible concepts such as area, volume, and measurement.

F75

Caregivers' Cognitive Matchmaking In A Museum Exhibit

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Research suggests that caregiver interaction supports children's learning in interactive exhibits in museums, but sociocultural theory suggests that caregivers will interact only when they judge the task to be beyond the child's ability. This study addresses differences in caregivers' level of engagement in joint interaction in a children's museum by the age of their child. In an exhibit where dinosaur skeletons are uncovered by digging, preschool families, compared to primary school families, stay longer, and caregivers engage more in joint attention. In addition, with portable seating, adults talked more, but only for the younger children. This study demonstrates that caregivers' interaction in an informal learning setting results from their attempt to bridge a perceived mismatch between their children's abilities and the affordances of the exhibit. To support learning in older children, more complex affordances of the exhibit must be made clear to caregivers upon entry to enlist their engagement.

F51

Slower Information Processing Associated With Sleep Disordered Breathing But Not Periodic Limb Movement Disorder

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Several studies have found impaired cognition in children with poor sleep. It is not clear whether this is true for all aspects of cognition, or whether it is specific to a particular sleep disorder or to sleepiness associated with any cause. Children diagnosed with either SDB or PLMD were tested with a cognitive and behavioral battery of standardized tests before and after successful treatment for their sleep disorder. Results indicated that children with SDB had significantly lower scores on measures of processing speed than children with PLMD, which improved with treatment. A measure of ADHD indicated that children with PLMD tended to have worse scores than those with SDB. After treatment ADHD scores of children with PLMD remained significantly worse than those of children with SDB. These data support the evaluation of children with learning difficulties or ADHD for sleep disorders prior to beginning behavioral or pharmaceutical interventions.

F89

Tall and Good-Looking: The Relationship between Raters' Physical Height and Judgments of Facial Attractiveness

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Theories of the attractiveness of averaged faces implicate norm-based coding of faces and experience-driven preferences. Studies with adults, children, and babies suggest norm-based coding during development because age-related changes in aesthetic judgments are related to the facial proportions to which children have the most experience. This study further explored experiential influences by correlating an adult's physical height with his/her preferred vertical location of the features in computerized faces. Taller raters created faces with larger ratios of forehead-to-chin size—resulting in a larger forehead and smaller chin, perhaps caused by biased exposure to faces from above eye level. Faces produced by shorter raters had a smaller forehead and larger chin. These results point to individual differences in aesthetic judgments, and provide converging evidence that viewers—both children and adults alike—judge attractiveness by means of a mental prototype based on facial proportions linked to their own height and inspection of faces.

S32

Infants' Use Of Emotion To Predict A Person's Action

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Research has shown that, within the first year, infants are able to extract information from others' emotions to guide their response to an ambiguous object. Using a looking-time paradigm, we examined whether 18-month-old infants can use an individual's emotions toward an object to form expectations concerning that individual's actions on that object. Infants were familiarized to an actor expressing either a positive or negative emotion toward an ambiguous object. After familiarization, infants saw the actor alternately push or pull the object. Infants in these two conditions responded differently to test events: infants in the positive condition

looked longer when the actor pushed the object away; however, infants in the negative condition did not. This demonstrates that 18-month-olds form different expectations about an actor's actions on an object based upon the actor's emotions about that object. Future studies will examine this phenomenon in younger infants and its relation to social referencing.

S69

Type-1 Diabetes And Development Of Memory

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Research on animal models has demonstrated a causal connection between Type-1 diabetes (T1DM) and neuronal death in the hippocampus--a critical structure for memory functioning-- possibly due to severe hypoglycemia occurring with T1DM. The present research examined the relation between T1DM and memory development during childhood. Children with T1DM who experienced episodes of severe hypoglycemia, children with T1DM who did not experience episodes of severe hypoglycemia, and children without T1DM (current n = 47; age range= 6-16) were tested on item recognition memory (i.e., determining whether an item had been seen before), and memory for qualitative details about the item (i.e., remembering the color and the spatial position of the item). Preliminary results showed that, among patients, those who experienced severe hypoglycemic episodes and those with earlier onset of the disease were more likely to exhibit disproportionately reduced spatial memory, suggesting that hippocampal function may be altered in these patients.

S25

Can Children Distinguish Between Sarcasm And Verbal Irony?

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Adults distinguish between ironic remarks directed at a specific target (sarcasm) and ironic remarks not directed at a specific target (verbal irony; Kreuz and Glucksberg, 1989; Lee and Katz, 1998). We investigated whether children are also sensitive to this distinction by presenting 9- to 10-year-olds with sarcastic criticisms directed at a specific target (i.e., criticism of a target's performance, a target's possession) and ironic criticisms that were not directed at a particular target (i.e., criticism of a situation). Children rated sarcastic criticisms directed at specific targets as more mean than ironic criticisms directed at non-specific targets. Children were also more likely to identify with the targets of sarcastic criticisms than with the listeners of ironic criticisms. These results show that 9- to 10-year-olds are sensitive to the distinction between sarcasm and verbal irony, and that this sensitivity arises because of empathy for a criticized other.

F14

Advances In Advanced Theory Of Mind: Can Acting Help?

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The ability to understand others' beliefs, desires and intentions is commonly referred to as "theory of mind." While we know a great deal about the development of basic theory of mind (in children 0-4), we know very little about the development of theory of mind skills in older children. The research presented here examines how acting training might foster "advanced" theory of mind. Acting requires that one analyze and understand other characters, but not necessarily sympathize with them. We tested children between the ages of 7 and 10 either studying acting or dance (equated in verbal IQ) on measures of advanced theory of mind and empathy. Due to the nature of acting training, we hypothesized that advanced theory of mind, but not empathy, should be fostered by the experience of acting. Findings will illuminate (1) factors involved in acceleration of advanced theory of mind and (2) the relationship between understanding vs. empathizing with others' mental states.

S3

The Influence Of Labeling On Preschoolers' Inferences About Race And Gender

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By the time they reach preschool, children are sensitive to verbal cues when making inferences about members of particular social categories. Across multiple experiments we explore the development of this phenomenon. Three-year-old majority-culture children were shown a picture of a target individual, taught a novel property about that individual (e.g. 'likes to make blicketts'), and then asked to extend that property to other individuals varying in their racial and gender categories. We find that in the absence of a verbal label, children extend the novel property indiscriminately to people across racial and gender categories, but not to animals or artifacts. But when provided with a novel category label for the individual (e.g. 'is a Wayshian'), children extend the novel property to a more restricted set of individuals, relying primarily on gender - but not racial - category membership. For preschool-aged majority-culture children, naming an individual promotes gender-based social inferences.

S65

Linkages Among Children's Study Skills, Memory Strategies, And Academic Achievement

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Little is known about the extent to which growing sophistication in the use of simple techniques for remembering is linked to later-developing skills such as note taking, outlining, and underlining. Data from a longitudinal investigation of children's memory, including measures of their strategic studying in a study skills task, will be used to demonstrate the linkages across fourth-graders' performance in an organizational sorting task, a verbal-rehearsal task, and the study skills task. For example, in the fourth grade concurrent associations were found between the children's strategic study behavior and their organizational sorting ($r = .32$, $p < .05$). In addition, organizational sorting in the first grade was associated with recall ($r = .35$, $p < .01$) and strategy use ($r = .27$, $p < .05$) on the study skills task in the fourth grade. Finally, data will be presented to demonstrate linkages between children's strategic study behavior and their academic achievement.

Children's Spontaneous Generation of Counterfactual Statements

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Experimental manipulations have shown that both adults (see Sanna & Turley, 1996) and children (German, 1999) are more likely to

generate counterfactual statements after a negative event. Adults also generate more counterfactual statements when an unexpected (vs. expected) outcome occurs (Sanna & Turley). Less is known about children's spontaneous generation of counterfactuals. The present study served two purposes: 1) to explore whether children generate counterfactual statements spontaneously and 2) to determine whether valence and expectancy affect the types of counterfactual statements generated. Thirty 3rd graders and 22 5th graders retold two stories that varied according to outcome (positive/negative) and expectancy (expected/unexpected). Results indicated that the children did spontaneously generate counterfactual statements and that they were more likely to do so when the outcome was negative. Patterns of counterfactual statements also were similar to the types generated by adults. Implications of these findings will be discussed.

Training Young Mothers on Early Childhood Development in a Selected Community in Karachi

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Pre-training needs assessment was performed by conducting focus group discussion on a random sample of young community mothers to identify the issues faced by them while raising their children of ECD age group (0-5 years of age) and to know their existing practices of dealing with those issues. The analysis of FGD was then used to design mother education training module. 40 community mothers were selected and trained which post training focus group discussion was carried out for evaluation. 75% of the participants suggested practical solutions to the issues they faced before the training 48% said that their role as mothers became better defined and they are now able to build strong bonding with their children and family on the whole. Overall almost 90% of the sample responded positively to the discussion.

F82

How Do Parents Communicate To Young Children About Location?

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Giving and following directions is a common aspect of everyday life, yet little is known about how parents communicate to children about location. We examined how parents communicate with 2.5-, 3.0-, and 3.5-year-olds about location. Hiding locations were two identical containers on the floor placed either close or far from a circle-shaped landmark and close or far from the mother and child, yielding four trial types. The experimenter hid a toy in one container while the mother (but not the child) watched. Mothers then attempted to tell the child in which container the toy was hidden without pointing. Children then searched for the toy. Preliminary results suggest that mothers use a variety of strategies to describe location, which include landmark references, self references, temporal/event references, order references, and movement references. Follow-up work will assess how effective these strategies are in eliciting correct searches from children of different ages.

F31

The Uncoupling Of Embodied Knowledge: Comparing Words And Actions In A Stroop Interference Task

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Following Piaget, there is growing evidence that perception and action play a foundational role in language and cognition. Here we test the hypothesis that the semantic knowledge associated with objects is grounded in sensorimotor experience. Using a variation of the Stroop task, children were presented with pairs of objects (e.g., hammer-screwdriver). Half of the objects were familiar and half novel. Children were first primed either to name or act upon the objects, as modeled by the experimenter. During testing, children were instructed to say or do the opposite. Preliminary results reveal differences in children's ability to decouple actions from objects relative to names. Moreover, this ability varies as a function of the familiarity of objects. The results are interpreted within a framework of embodied cognition.

S12

Context Cues And The Emergence Of Source Monitoring In Toddlers

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The research reported here provides a window into the early emergence of source monitoring abilities. Children as young as 3 - 4 years of age do well on simple versions of action based source monitoring tasks. Research on even younger children, however, remains lacking. In this study we extended the age range downward to 2.5 year olds. For the procedure we used an action based task in which children and experimenter took turns constructing a model farm. After construction, children were administered a surprise memory test in which they were asked who had placed each item. Two conditions were included: the standard version in which few contextual cues are available, and a new condition in which context cues remain intact. As predicted, children in the context condition were more accurate in recalling the source of actions. Nevertheless, children in both conditions performed very well on the source questions indicating a surprisingly early age of emergence for this ability.

S62

Comparison Within- And Between- Basic-level Kinds Fosters Preschoolers' Word-learning.

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We tested whether the opportunity to compare novel objects from either the same or different shape-based kinds affects the type of meaning preschoolers assign to a word for one of the objects. Preschoolers learned two novel labels for two unfamiliar stuffed animals. The words were modeled in isolation, without any surrounding sentence context, leaving open the meaning of the words. When the two labelled animals were from the same kind, children treated the target word as a proper name, restricting it to the target object and failing to generalize it to a third object that looked identical to the target. When the labelled animals were from different kinds, children generalized the target word to the third object, consistent with a count noun (object kind) interpretation. The findings provide new evidence of preschoolers' use of comparison in lexical development, and of the pivotal role of shape-based kinds in this comparison process.

SA

External vs. internally-driven change and between-feature correspondence in categorization of unfamiliar objects

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A series of experiments have been run to test the role of the pattern of object change/transformation in concept formation. 3-D animations of transformations of relatively simple objects were created. A colored object surface was being covered by gray blobs, either emerging from the object inside or flying from outside, and finally, when the surface was fully covered, another, colored spot was placed on the object. Preschoolers were familiarized with two different movies (in some conditions with artificial object name). Then one of the familiarization movies and a new movie were displayed concurrently. Subjects were asked to show nn (object name) or, in no-name condition, "the correct one". The only difference between two test movies was the color congruity between initial object and the central, colored, spot. We expect that subjects familiarized and tested with internal-change movies should be more influenced by feature correspondence than those in the external-change group.

F45

Infants' Perception Of Natural And Arbitrary Rhythmic Structures In Music

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Perceptual development during infancy appears to proceed from general to specific in such diverse domains as language, faces, and music, but flexibility is presumably limited to natural or learnable structures. For music, a culture-specific perceptual asymmetry emerges between 6 and 12 months of age, when infants' ability to distinguish rhythms declines in foreign but not familiar musical contexts. If basic temporal processing constraints influence which rhythms can be learned, even very young infants should have difficulty processing rhythms that are structured in an arbitrary, unnatural manner. To test this hypothesis, the present study measured 4 to 6-month-old infants' sensitivity to subtle temporal changes of melodies after habituation to Western, Balkan, or Unnatural structures. Infants exhibited a novelty preference in both Western and Balkan conditions, but showed no preference in the Unnatural condition, suggesting that early perceptual flexibility is limited to those structures that occur naturally in music.

F86

Learning about the equal sign: Does contrasting with inequalities help?

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This study investigates the effectiveness of a contrasting cases approach to teaching children about the equal sign. We hypothesize that instruction contrasting the equal sign with inequality symbols allows children to develop a desired understanding of the equal sign as meaning *the same as*; not *greater* and not *less than*. 58 third- and fourth-grade children were divided into three lesson groups: (1) contrasting ">, <, and =" symbols; (2) "=" sign only; (3) control group. The contrasting group was more likely than the other groups to demonstrate gains in equal sign knowledge from pretest to posttest, $Wald(1, N = 58) = 3.93$, $p < .05$. The contrasting group also scored higher on a posttest assessment of inequality symbol knowledge, $t(38) = 2.26$, $p = .03$. Children in the contrasting group learned about the equal sign and inequality symbols in the same amount of time as other children learned about the equal sign alone or not at all.

F68

An Analysis Of Novel Event Recall: Remembering And Forgetting Over A Delay

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In a longitudinal study, two cohorts of children (n = 120) participated at 36-and 42-months of age with their mothers in novel activities. After delays of 1-day and 3-weeks, children's memory for these experiences was assessed. In response to open-ended questions, children recalled 5 and 7 features of the activities (19%-25% of those presented) at the 36- and 42-month time-points, respectively, as well as 20 additional details. On average, feature recall did not decrease over time, but different patterns were noted: some children reported the same number of features at both assessments, whereas others demonstrated either a gain or loss. For example, at 36-months, in one cohort only 6 children recalled the same number of features at the interviews, whereas 14 forgot features, and 16 evidenced improvement over the delay. We examine these contrasting patterns in the context of language skills and mother-child interactions during the activities.

S35

Parents' And Children's Understanding Of Each Other's Perspectives Of A Conflict

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Mothers, fathers, and two children from the same family reported memories and appraisals of a recent unresolved conflict. Free recall and probed questions elicited the conflict theme, outcome, blame, emotions, goals, beliefs, and impact of the conflict. Mother-child and father-child reports and appraisals were compared. Regardless of parent-child dyad, few developmental differences existed in the use of internal state language when discussing a personally meaningful conflict. Parents' and children's self-reports showed their feelings to be directly related to how the conflict ended. Everyone was biased towards their own goals and beliefs rather than the other person's, with the exception of the other person's emotion states. Mother-child and father-child reports differed in the degree of parents' winning, appraisals of blame, and how happy children reported their parents feeling after the conflict ended. Differences between mothers and fathers are discussed with respect to differential power relations among parents and children.

FA

Point it for me with your chin if you have a good reason!

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The ability to follow human pointing gesture has been shown in a variety of nonverbal subjects from various species, including human infants (Behne, Carpenter, & Tomasello, 2005), non-human primates, dogs, dolphins and seals. It is still a matter of a debate whether subjects appreciate the communicative intentions behind the gestures they are following. The aim of the present research is to further inform this issue. It is assumed that if infants attribute

communicative intentions to the gesturer in the object choice situation, they should be able to follow novel gestures (e.g. pointing with a chin) especially when situational constraints (gesturer's hands are occupied) make the novel gesture a rational way to execute the gesturer's communicative intention. The aim of the present study is to asses whether infants can apply the principle of rationality in their understanding of novel communicative gestures. Preliminary results will presented be discussed.

S5

Children's Understanding Of Representations Of Their Bodies

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Previous studies showed that preschool-aged children have difficulty using a doll to represent their bodies. In these studies children were given a doll and told to pretend the doll was them. The present study examined whether 2.5 - 3-year-olds would be better able to map between their body and a representation of their body if they were involved in creating the representation. Children participated in two conditions in counterbalanced order: one in which the child's body was traced by the experimenter and one in which the experimenter utilized a previously created outline drawing of the same size. Data collection is ongoing. The hypothesis is that when children are involved in creating the outline drawing, they will perform better on a task in which they are required to map from their body to the representation of their body.

F6

The Development Of Anthropocentrism In Western Children's Naive Biology

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Extensive developmental research has suggested that children's early conceptions of the natural world are strongly anthropocentric, that they first learn about the natural world by comparing all entities that they encounter to humans, and that this early anthropocentrism must be overturned if children are to embrace a (Western) scientific view. However, we propose that childhood anthropocentrism may not be a universal feature of early development but may instead be learned gradually by children based on the information they receive from adults in Western communities. In a series of naming and induction tasks, we document in five-year-olds the classic anthropocentric patterns of reasoning, but show that this pattern is not characteristic of three-year-olds. Rather than continuing to privilege humans in the psychological domain only, Western children transfer their human-centric model to the biological domain, resulting in the anthropocentric reasoning consistently found in studies of school-aged urban children.

SA

ERP and Behavioral Measures of Task-Switching Efficiency in Preschool Children

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Preschool children can easily follow either of two rules, yet will sometimes continue to follow the first rule after rule switch. Adults show longer RT after rule switch. Inhibition, working memory capacity (WMC) and working memory strength (WMS) have been hypothesized to explain task-switching (TS) impedance (Diamond, 1998). We developed an event-related potential test of TS efficiency in 4-year-olds, 6-year-olds, and young adults (n = 36). Participants also completed stop signal (inhibition), rule memory (WMS), and digit span (WMC) tests. TS costs decreased with age. Six-year-olds were faster than 4-year-olds in inhibition and WMS, but not WMC. Inhibition and WMC variance did not account for age differences in TS costs. WMS predicted TS speed in children, but only for the slower rule. Adults showed P3a-like components (Barcelo et al. (2002). Asymmetric switch difficulty was reflected in P3b amplitude differences between tasks. Six-year-olds showed a P3a-like response to switch cues, but a frontal Nc in place of P3b. They also showed a P3b to "stay" cues, suggesting reinforcement of WM representation by task-cue repetition. Four-year-olds showed a P3a only to switch responses, but no P3b to cues, suggesting weak WM coherence. Children might rely more than adults on frontal systems during task switching. Development of posterior WM systems might partly underlie age-related TS improvement through childhood.

S57

Task Effects On Toddlers' Abilities To Determine The Referent Of A Novel Name In A Fast Mapping Context

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Children's excellent word learning is often attributed to fast-mapping: quickly linking a novel name and a novel object (e.g., Carey, 1978) following minimal exposure. However, the dynamics of the referent selection fast mapping task are quite complex. The present research explores the dynamics of referent selection across changes in stimulus presentation. Twenty-four -month-old toddlers were presented with familiar and novel objects and asked to select the referent of familiar and novel names in a variety of situations where the information available about the present and absent objects was more or less helpful. Results are discussed in terms of the effects of the information presented on the individual trials and over the course of the session.

The Origins Of Biased Numerical Estimation: Anchoring Effects In A Non-Human Primate (Macaca Mulatta)

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Developmental and comparative psychologists have devoted considerable empirical effort to examining the origins of our numerical capacity. Much work has demonstrated that both infants and non-human primates possess a capacity to represent numerical information approximately. To date, however, little work has examined the nature of the specific errors made by this approximate estimation system. This is unfortunate as an understanding of this system's errors might allow us to gain more insight into its operation. Here, we take insight adult judgment and decision-making and investigate whether some of the error in numerical estimation is due to an anchoring bias, a phenomenon observed in adult humans in which initial values bias subsequent numerical estimates. We presented rhesus monkeys with large number addition events and found that macaques' final numerical estimates appear to be biased by the quantity they initially observed. Results are discussed in of core theories of numerical processing.

F11

Does Repetition Help Or Hinder 12-month Olds' Ability To Learn Novel Grammatical Structures?

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To learn grammar, infants must generalize to novel structures rather than memorize internal relationships within individual sentences. To facilitate generalization, hearing many unique sentences should be better than listening to a smaller, repeated set of sentences. Infants who heard 280 unique sentences of an artificial language during familiarization could distinguish grammatical and ungrammatical sentences as measured by looking time, attending longer to ungrammatical sentences. Infants could do this without access to semantic information. However, infants who heard 40 sentences repeated 7 times did not make this distinction. Furthermore, infants in the first condition were able to detect easy violations (where initial and final phrases were switched) and more difficult transitivity violations (which contained one impossible transition). Therefore, hearing unique sentences allows learners to abstract subtle grammatical relationships. The variability attendant with unique sentences directs attention to the sentence structures of the language, enhancing categorization, and away from individual lexical items.

F40

Developmental Changes In Spatial Strategies And Memory Flexibility During Childhood

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To examine the flexibility with which children learn and remember object locations, 7-, 9-, and 11-year-old children and adults learned the locations of 20 objects in a box. Boundaries separated groups of locations along the sides or in the quadrants of the box. Participants watched the researcher place the objects. Then, participants replaced the objects until they could correctly place all of them. The final task was to place the objects on a blank floor with no boundaries. Seven days later, participants learned the locations of a new set of objects using the opposite boundaries. Researchers noted the temporal order of placement and the coordinates of the objects at each test session to assess organization and memory. As predicted, children shifted from reliance on an alternating placement pattern to a sequential pattern over development. Moreover, the ability to flexibly use the boundaries to remember locations increased over development.

S71

Speech Priming In Preschool Children

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The syntactic form and rate of perceived speech can influence future productions in adults. Previous work has shown that children are similarly primed by syntax. Do syntactic priming and prosodic priming exist simultaneously in children? Participants (4 and 5 years old) alternated between listening to priming sentences that described visual scenes and producing their own descriptions of similar scenes. The priming sentences varied in rate (fast, slow) and syntactic structure (active, passive). Children's sentences will be analyzed to determine if their produced sentences reflect the prosodic timing and syntactic structure of the primes. Children's responses to a memory test will also be analyzed to determine if they have a representation for the priming sentences that includes both the syntax and prosody.

S63

The Influence Of Pets On Infants' Learning About Cats And Dogs

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Relatively little is currently known about how infants apply knowledge gained outside the lab to their learning of stimuli in laboratory procedures--despite the fact that many assumptions are made about the relation between learning in the two contexts. We asked parents of four- and six-month-old infants to describe their children's experiences with pets. Over half of parents reported having pet cats and dogs at home, and most reported that their infant had at least 40 hours of contact with their pet(s) each week. In a subsequent experiment, we presented 6-month-old infants with photographs of cats or dogs and found infants with pets at home were more attentive to the pictures than were infants without pets. Such results have implications for how infants apply knowledge learned in one context to their learning of new information in another context.

F65

Young Children Conceive Exact Equality Between Numbers

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Infants' representations of large numbers are approximate. However, number words represent exact quantities. When they start using number words, children interpret them as approximate, meaning something like 'a lot'. Here, we study whether children aged 32 to 36 months can conceive exact equality between quantities, before they understand that number words are exact. To begin, children are presented with a set of finger puppets, sitting on the branches of a tree in one-to-one correspondence. All the puppets disappear in a box, and then come back to the branches. Children search more in the box when it is supposed to contain one more puppet than when it is supposed to be empty. Furthermore, when one puppet is added or subtracted to the initial set, they change their searching behaviour: they know that even minimal transformations such as +1 or -1 affect the numerosity.

FA

Young children's use of mutual exclusivity and pragmatic cues in word learning: Evidence from Korean 3- to 4-year-old children

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Children typically assume each object has only one category label (e.g, Markman & Wachtel, 1988). The present study examined whether Korean preschoolers rely on the mutual exclusivity (ME) bias even when there are conflicting pragmatic cues, just as English-speaking preschoolers do (Jaswal & Hansen, 2006). A speaker pointed to (Study1) or looked at (Study2) a familiar object, not a novel object while requesting a novel word's referent. In Study 1, 4-year-olds selected familiar and novel objects about equally often, whereas 3-year-olds chose familiar objects more often. In Study 2, 3-year-olds were more likely to choose novel objects. Thus, the results were not always consistent with a lexical account of ME and suggested that Korean children may weight various pragmatic cues differently.

FA

Developmental Research and Broadcasters' Educational Television for Children

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In 1990, Congress unanimously passed the Children's Television Act, which mandates that commercial broadcast stations provide programming to address the "social, emotional, cognitive and intellectual needs of children." After studies revealed that broadcasters were making dubious claims about the educational value of their shows (e.g., that The Jetsons teaches children about the future), the Federal Communications Commission articulated exactly what is meant by "children's educational programming." This poster explores the current state of children's television, the extent to which educational programming reflects a clear understanding of children's learning from television, and the ways that developmental research is used in the formation of media policy. In doing so, the poster presentation draws from a content analysis of children's educational programming, interviews with producers and broadcasters, and an analysis of expert testimony to Congress on the role of educational television in the life of the developing child.

F7

Intersensory Redundancy Accelerates Preverbal Numerical Competence

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Intersensory redundancy can facilitate animal and human behavior in areas as diverse as rhythm discrimination, signal detection, orienting responses, maternal call learning, and associative learning. In the realm of numerical development, infants show similar sensitivity to numerical differences in both the visual and auditory modalities. Using a habituation-dishabituation paradigm, we ask here whether providing redundant, multisensory numerical information allows six-month-old infants to make more precise numerical discriminations. Results indicate that perceptually redundant information improved preverbal numerical precision to a level of discrimination previously thought attainable only after additional months of development. Multimodal stimuli may thus boost abstract cognitive abilities such as numerical competence.

SA

Cultural Differences in Use of Pointing During Storytelling Sessions

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Use of pointing and touching the picture during mother-child storytelling session among Japanese and Chinese pairs are compared. Forty mother-child pairs (3-5 years old) participated. In previous analysis some cultural differences in how and when children points are observed. In this study the amount of pointing mothers perform are compared. There were no cultural differences in the amount of pointing per minutes. However, Japanese mothers used more pointing with girls than boys ($p<.05$). No such pattern was observed with Chinese mothers. The differences may reflect the cultural shaping occurring in non-verbal behavior as early as 3 years old. Contents of talks are compared with the pointing to investigate what contributes to the differences.

S79

Attention Please! The effects of instruction on preschoolers' attention in a distractability paradigm

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This study investigated how instruction affected preschoolers' attention to different cognitive tasks while a comprehensible distracting event played continuously in the periphery. Forty-four 3- and 4-year-olds worked on four tasks for three minutes each. They were assigned to one of three conditions: high instruction (frequent instruction to ignore the distractor), moderate instruction, and no instruction (no instruction about the distractor). The duration of looking to the distractor, inattention ("off task" behavior), and looking to the task were measured. Children who received frequent instruction exhibited shorter looks to the distractor than did children who received no instruction. Children who received frequent instruction looked longer to the task than did children who received moderate instruction or no instruction; 4-year-olds exhibited longer looking than did 3-year-olds. There was no effect of condition on measures of inattention. Thus, the instruction differentially affected how preschoolers distributed their attention between the tasks and distractor.

F77

Development Of Cognitive And Emotional Experience In Moral Motivation

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This study explores moral motivation and development in terms of cognitive and emotional experience. In this process, insights and methodology of Deci and Ryan's Self-Determination Theory (1985, 2000) are applied to the study of moral motivation and development. Consistently, Kohlberg's stages of moral reasoning (1969) are reconsidered as stages of motivation. In this context, particular emphasis is placed on intrapersonal variability in moral meaning making based on cognitive and emotional dynamics of motivation. Approximately 300 college students and 75 high school students participated in the study by completing a new questionnaire. Findings revealed age-related developmental patterns of order and variability in emotional experience and multiple stages of moral motivation.

S18

Comparing Palestinian And American Children's Understanding Of Fear

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The purpose of this study was to explore how the social environment affects children's understanding of emotion, with a specific focus on fear. Participants were Palestinian children (N=30, 3-7 years) living in the West Bank/Israel and American children (N=30, age-matched). Children were first asked to describe the causes and consequences of emotions (happiness, sadness, anger, fear, and surprise). Next, they completed five categorization trials. We hypothesized that the volatility of the Palestinian-Israeli conflict would affect the breadth of the Palestinian children's emotion understanding in two ways in the current study: On the story-telling task, Palestinian children will be less likely to initially understand fear in terms of fantasy themes than American children. On the categorization task, a higher proportion of Palestinian children will

include nontarget negative facial expressions in the fear category than American children. Results will be discussed in terms of whether children's understanding of emotion varies across cultures.

S7

Labeling Context Influences Infants' Generalization Of Nonobvious Object Properties.

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We examined the influence of labeling context on 17-month-old infants' inductive inferences about nonobvious properties. Seventy-four infants were presented with novel target objects with a nonobvious property, followed by test objects that varied in shape similarity. Objects were introduced without shared labels or with shared labels that were presented either with or without cues to referential intent. When objects were not labeled or were labeled nonreferentially, infants generalized the nonobvious property to high-similarity objects only. When objects were labeled referentially, infants generalized the nonobvious property to high- and low-similarity objects. When objects were labeled referentially but labels were not embedded within a sentence context, infants generalized the nonobvious property to high-similarity objects only. These findings suggest that infants rely on shared labels to guide their inductive inferences only when they are presented with cues to referential intent and when they are embedded within a sentence context.

S4

Accent trumps race in children's social preferences

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Previous research has shown that young children are attentive to social categories such as race, gender, and age when evaluating novel individuals. A series of experiments investigated the role of language in children's developing social preferences. Five- and 6-year-old children demonstrated explicit friendship preferences for speakers of a native language compared to speakers of a foreign language. Variations in accent, even when the content of speech was intelligible to children, were sufficient to evoke this preference for native speakers. Current research is investigating the robustness of this preference for native speakers in comparison to preferences for other, previously investigated social categories, such as race and gender.

S89

"Did She Do It on Purpose?" Young Children's Monitoring During Questions about Intentions

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This study was designed to explore how to maximize preschool aged children's abilities to answer difficult interview questions. We hypothesized that children would be more accurate when they were given forced choice questions which emphasize that the interviewer is interested in intentions, and not actions. We compared these forced choice questions to basic "yes/no" closed-ended questions. Our secondary hypothesis was that children with more mental flexibility and higher teacher-ratings of effortful control abilities would be better able to monitor questions about intentions and identify which portion of the question the interviewer was interested in having answered. Our primary hypothesis was partially supported. Children performed equally well when they were asked either forced choice questions or yes/no questions in which the intention asked about matched the intention witnessed. Children were more accurate with each of these question types as compared to non-matching yes/no questions. Forensic applications are discussed.

FA

Preschoolers' Understanding of Density: Type of Knowledge vs. Effect of Task Content

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Discrepant performance across task contexts is often taken as evidence for different types of knowledge, such as implicit vs. explicit knowledge. To counter such an explanation, the current study analyses how contexts differ – specifically in tasks that measure children's naïve conceptions about density. What are the task constraints that young children can capitalize on? The general hypothesis is that children pick up on the structure that is presented to them in the immediate context. Preschool children and adults participated in two conditions that differed merely in how the test objects were arranged. Objects were presented one-by-one in the supportive condition, and they were presented in pairs that pitted mass against volume in the unsupportive condition. In each case, participants had to predict whether an object will sink or float. Independently of age, participants performed better in the supportive than the unsupportive condition - a finding that has important impliciations for science education

F20

Toddlers' Conventional Understanding: The Role Of Native Vocabulary Knowledge

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The present study provides an initial examination of 24-month-olds' understanding that conventional systems can vary across speakers. Children's willingness to learn new words from a native speaker of Dutch was tested by both the Dutch speaker and an English speaker. We also asked whether vocabulary size, which varies significantly at this age, was related to infants' performance. As a group, 2-year-olds showed little evidence of learning new word-object links from the Dutch speaker; however, there was a relationship between performance and children's vocabulary size. Children with high productive English vocabularies successfully learned from the Dutch speaker whereas children with low vocabulary scores performed at chance levels. Furthermore, children with high productive vocabularies responded at above chance levels on test trials presented by the Dutch speaker (70% correct) but not to similar test trials presented by an English speaker (44% correct). This provides preliminary evidence that proficient English monolingual learners may appreciate the boundaries of different conventional systems.

F59

Exemplar Memory Of Cats And Dogs By Six-month-old Infants

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We examined infants' memory for individual items presented in a sequence of familiarization trials. When familiarized with six exemplars, each shown on one of 6 15-s trials, infants show better

memory for the items they saw more recently than those they saw earlier in familiarization. Interestingly, although infants exhibit good memory for items shown on trials 4 and 5, they do not show good memory for the item shown on trial 6. Experiments were conducted to examine infants' memory after familiarization with only a single item and the effect of a delay on infants' memory for particular items. Together, the results suggest that (1) infants' memory for items depends on when during the sequence the items were presented, and (2) a delay period in which infants can consolidate their memory may facilitate recall.

FA

What do 3- to 5-year-old Children Know about how They Know the Source of Memories on Picture Book Episodes?

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The study explores what preschoolers know about how they know the source of memories. Forty-eight children comprising four age-groups (M=38, M=45, M=56, M=65) participated. Children were presented four picture book pages with three episodes on each page covert by magic windows. On each page, two persons per source task (1 internal, 1 external, 2 reality monitoring (unfamiliar, familiar) tasks) looked under one magic window and described what was seen. Immediately children were asked to make old-new-recognition, source recall and answer the open-ended question how-do-you-know-the-source. The answers of the source questions were categorised into one of 13 categories. Related categories were combined into five second-order categories: No-explanation, incorrect-explanation, unspecific-explanation, procedure-related-explanation and perception-related-explanation. The results indicate that the explanations to all how-do-you-know-the-source questions are associated with age. In addition, results indicate that with increasing age the explanation categories seem to change from no-/incorrect-explanations (3-years-olds), to procedure-/perception-related explanations (4-year-olds) and to unspecific-explanations (5-year-olds).

S88

Cognitive and Social Consequences of Developing Narrative Skills: How Narrative Skills Predict Both Decreases and Increases in Suggestibility

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Despite the large number of studies devoted to examining individual differences in suggestibility, there has been little success in explaining within-group variation. In the present study we examine the relationship between children's narrative skills, which have been identified as an important contributor to memory development in young children, and suggestibility and memory accuracy. Sixty-six preschool-aged children engaged in a novel staged event with a classroom visitor. They were subsequently interviewed about this event, first by providing an open-ended narrative which was then followed by a series of suggestive questions. Children were also interviewed about other autobiographical past events. The quality of the child's event narrative was predictive of decreased assenting to misleading questions, while the quality of the child's autobiographical narrative was predictive of increased assenting. The results are discussed in light of the cognitive and social consequences of narrative skill development on children's developing memory capabilities.

S61

Preschoolers Use Sampling Information To Infer The Preferences Of Others

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We investigate whether an apparent violation of random sampling drives children to infer that the person choosing the sample is expressing a preference. Two groups of children will be shown a box containing 2 types of toys in a 1:1 ratio. They will then see a puppet removing six toys - all of one type - from box and playing with them. One group of children will see the puppet choosing the toys while looking at them (choice condition), the other group will see the puppet choosing the toys while blindfolded (random condition). Then children will be shown bowls full of toys and asked to give the puppet something to play with. A difference between conditions will show that children understand that a violation of random sampling indicates a preference only when the sample can be freely chosen, suggesting that children's social understanding can interact with statistical evidence.

S73

Nonverbal number matching in young children: Effects of gesture and conventional number knowledge

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Two- and three-year-olds were given a nonverbal numerosity matching task. The task involved matching a target set (1 to 6 elements) to one of two choice alternatives. We asked whether performance on this task benefited when children pointed to each element in the target set. We also examined whether performance was better for children with greater understanding of conventional number. Children were placed in a Gesture Group or a No-Gesture group. Children in the Gesture Group were encouraged to point at each element in the target set and children in the No-Gesture Group were encouraged to look at each element. Conventional number knowledge was assessed using two tasks: Give-A-Number and How-Many. Results showed a significant effect of conventional number knowledge (2- or more knowers performed better than non-counters and 1-knowers) but not of Age or Gesture condition.

S6

Investigating the relationship between music training and mathematico-spatial cognition

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Previous research has uncovered correlational and causal relationships between the amount of music training a child has pursued and their mathematical and spatial reasoning skills. While the findings are intriguing, the reasons for them remain unclear. The current research will explore and present evidence bearing on the nature of the skills that are related to music training per se, by testing children with various types and durations of extracurricular training on a spectrum of mathematical and spatial measures.

F37

Rhesus Monkeys' Use Of Various Geometric Cues In A Search Task

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What are the foundations of geometric knowledge? Are some geometric concepts more fundamentally rooted than others? Do primates spontaneously use some geometric cues more adeptly than others? In four experiments with free-ranging rhesus monkeys on Cayo Santiago, Puerto Rico, we tested for spontaneous encoding and usage of distances, sides, and angles, in a manual search paradigm. We found that monkeys succeeded in using a three-dimensional isosceles triangle to recall food location. Consequently, we isolated and tested each of geometric cues (distance, side lengths and relations, and angle) within the isosceles triangle. Interestingly, we found that the sides-only condition gave identically successful results as the full triangle condition, while the distance-only and corners-only conditions yielded chance performance. This study suggests that the primate mind is likely to be equipped with mechanisms designed to compute specific geometric properties, such as length and sense relationships, of specific types of environmental stimuli, such as surface layouts.

F23

Children's Understanding Of Evolution: Learning From Museum Exhibits About Natural Selection

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Thirty children attending courses at a natural history museum were given in depth interviews on their bird knowledge, their understanding of bird diversity, the bird-dinosaur connection, and natural selection. The 40-60 minutes interviews were videotaped so that they could be used by team members for exhibit development and to enable detailed analyses of the transcripts and children's language use. The most crucial finding to emerge is that a narrative or story-telling structure can be used to scaffold children's understanding of natural selection. Children of 8- to 12-years of age and children who knew more about bird inheritance and the bird-dinosaur connection were especially likely to benefit from this narrative structure to grasp the principles of natural selection. Moreover, on almost all questions the 5- to 7-year olds differed significantly from the older children.

S30

The Cost Of Prospective Memory In Preschoolers

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The current study was designed to assess whether young children who engage in prospective memory do so at a cost to current cognitive processing (see Smith, 2003, for similar findings with adults). In the current study, 4-, 5-, and 6-year olds either performed a simple ongoing matching task only (control condition) or performed the matching task with an embedded prospective memory task (experimental condition). Preliminary results suggest that children in the experimental condition are slower and less accurate in the matching than in the control condition, but children in both conditions improve with age. Finally, it is predicted that children within the experimental condition who fail the prospective memory task will be faster and more accurate on the matching task than those children who pass the prospective memory task. This pattern of results would indicate that cognitive resources for current tasks are compromised in the face of prospective memory.

S72

The Malleability Of Implicit Gender Stereotypes

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Two studies explored the nature and malleability of the implicit gender stereotype that males prefer sports and girls prefer reading. In Study 1, children's and adults' implicit stereotype was measured before and after they were exposed to stereotypical or counter-stereotypical exemplars. Study 1 found that the more flexible children and adults perceived the counter-stereotypical exemplars' sports or reading attribute, the more likely they were to show reductions in their implicit stereotypes. Further, there was a salient gender difference in the implicit stereotype, as male children and adults displayed it while their female counterparts did not. Study 2, however, found a marginally significant gender difference in the opposite direction- females showed the implicit stereotype to a marginally greater extent than males. The difference in expression of the implicit stereotype by gender groups across the two studies likely resulted due to the different populations that were assessed. Results from Study 1 will be discussed in terms of the role psychological essentialism plays for reasoning about social group stereotypes.

Children's Implicit Theory of Officers of the Law: Examination of the Gender Differences in their Drawings

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The purpose of the present study was to examine children's implicit theory of social roles through their drawings. In specific, the study looked at children's implicit theory of a police officer, and examined possible gender differences in how these were portrayed in their drawings. With the hypothesis that children's implicit theory of the police will lead them to draw more violent police activities and male police officers than helping female ones, 104 third, forth, and fifth graders were given in-class assignment by the researcher, with the instructions to "draw a police officer working", The gender of the police officers and their activities were coded using detailed coding procedures. The general results showed that in fact more than half of the drawings showed violence and more than two thirds were male officers. The significant gender differences found will be discussed in light of implicit theory and drawing as a methodology.

S87

Parent-Child Interactions at a Museum Map Exhibit: Developmental Change and Individual Differences

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The ability to use spatial-graphic representations such as maps and graphs is a critical component of cognition showing both age-linked and individual differences. To investigate the possible influence of parental guidance on this domain, we studied parent-child interactions in a museum exhibition on maps. Participating parents and children (grade K – 6, 179 dyads) first completed a spatial skill task and measures of interest in, experience with, and concepts of

maps. Dyads were then videotaped at four stations within the exhibit. Exit measures assessed participants' map liking and concepts, and performance on a map location task. Group level data showed a significant increase in the breadth of map concepts with age and after visiting the exhibit. Higher spatial skills were associated with better performance on the map location task. Interaction styles and strategies are discussed in relation to (a) children's age and (b) children's and parents' spatial skills.

F43

Children Rely On Unexpected Labels To Make Inferences Beyond The Original Task

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In category induction tasks, hearing an object's name can lead even toddlers to make inferences about the object that are different from those they would otherwise make. Do children really believe these unexpected labels? Or are they merely playing along? Our previous work suggests that 3-yr-olds' label-based inferences cannot be explained solely by social demands. In fact, children will pass unexpected labels on to another (presumably naive) person, suggesting that they actually believe those labels. In this study, we show that 3-yr-olds will make label-based inferences not just about the properties queried by the same experimenter who provided the unexpected labels, but also about new properties queried by a different experimenter, who does not even mention the labels.

An Investigation of the Underconfidence-With-Practice Effect with Young Children

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Young children are typically overconfident when asked to assess their own learning, and such overconfidence even persists across multiple trials of a task. By contrast, adults' predictions typically become underconfident when asked to judge their learning across trials, which has been called the underconfidence-with-practice effect (UWP). One resolution to these differences is that the former studies with children used different stimuli across trials whereas the latter studies with adults used the same stimuli across trials. Twenty-two kindergarteners (M = 6 years, 2 months) individually studied ten pictures of familiar objects. On each of the three study-test trials, they studied the same items, predicted how many they would be able to recall, and then recalled as many object names as possible. Children did not exhibit the UWP effect. Rather, their overconfidence persisted across the three test trials. Discussion will focus on children's judgment accuracy and the theory of the UWP effect.

FA

Improving Children's Performance in Scientific Reasoning: The Influences of Individual's Working Memory Capacity and Cognitive Load during Practice

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How the individual's capacity of executive function and cognitive load during practice influence children's abilities of scientific reasoning was investigated. Two groups of 16 5th-graders were trained with self-directed experimentation task in three sessions during three consecutive weeks either with the help of computer-aided tool for data recording and sorting (low cognitive load) or not (high cognitive load). Several indices about their performance in the task before and after the training were compared. The results showed that only low-load group progressed significantly in designing controlled experiments and coordinating evidence and theory. In addition, children with high or low level of working memory capacity took advantage of the practice differently. The implications in education and cognitive development were discussed.

S31

Young Children's Attention To Evolutionary And Modern Fear-Relevant Stimuli

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The ability to respond to threat quickly and efficiently is an important survival mechanism for humans and other animals. Because of the importance of detecting and responding to potential threat, some theorists have suggested that evolutionarily threat-relevant stimuli, such as snakes and spiders, are detected more quickly than non-threat-relevant stimuli. However, there is no reason to expect that modern threats, such as knives and syringes, would be detected particularly quickly as well. In the current research, 3-year-olds were presented with 3 by 3 matrices of evolutionary and modern fear-relevant and fear-irrelevant stimuli on a touchscreen monitor. Participants were instructed to locate a target on the screen. Preliminary results indicate that the children detect only the evolutionarily threat-relevant stimuli and not the modern threat-relevant stimuli more quickly than non-threat-relevant stimuli.

F26

The Self Through Time: Autobiographical Memory And Delayed Self-recognition In Autism

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Past research indicates that children with autism struggle with tests of autobiographical memory and demonstrate irregularities with regard to mirror self-recognition. To examine the link between autobiographical memory and self-recognition, typically developing children were compared to children with autism on tasks of delayed self-recognition and recalling actions and mental states. Four groups of children were included: a) typical 3-year-olds, b) typical 5-year-olds, c) children with autism with a verbal mental age of 5 years and d) children with non-autism developmental delay with a verbal mental age of 5 years. Children with autism performed significantly worse than typical 5-year-olds on: delayed self-recognition, recalling whether they or an experimenter had placed a picture card during a card sort game, and recalling intentions during a turn-taking game. This is despite performing the same as typical children with regard to receptive language and visual memory. In contrast, children with non-ASD developmental delays performed similarly to typical 5-year-olds on delayed self-recognition, as well as recalling their own and another's intentions. It is possible that tasks targeting the link between the past and present self are uniquely challenging for children with autism spectrum disorders, and may indicate a difficulty conceptualizing of the self through time.

F73

Developmental Differences in the Maintenance of Context Information in Working Memory

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Braver and his colleagues (e.g., Braver, Cohen, & Barch, 2002) have proposed a theory cognitive control that depends upon the ability to represent and maintain context information in working memory. Context refers to representations (e.g., task goals, prior stimulus events) within working memory that govern the use of other representations. The use of context information guides behavior and supports attention and inhibition throughout the completion of a task. The present study examined whether there are developmental differences in the representation and/or maintenance of context information in working memory by comparing the performance of 3rd- and 6th-grade children with both a short and a long cue-probe delay in the AX-CPT. Age related changes were found only at the long cue-probe delay, suggesting that developmental differences exist in the maintenance, but not in the representation, of context information in working memory.

S56
The Development Of Metacognitive Monitoring In Early Childhood

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The aim of present research is to investigate the development of metacognitive monitoring in early childhood. To this end, 3-, 4-, and 5-year-olds completed a perceptual identification test and a forced-choice recognition memory test. Item difficulty was manipulated within subjects: half of the items on each task were designed to induce high levels of certainty; half of the items were designed to induce low levels of certainty. Immediately after each identification or recognition response, children rated their confidence using a simple 2-point scale. Data collection is ongoing (current n = 32). Preliminary results suggest that even 3-year-olds are capable of monitoring certainty (i.e., report higher confidence in low- as compared to high-difficulty items), but that this ability improves throughout the preschool years. Furthermore, preliminary results suggest that the ability to monitor certainty in the perceptual domain emerges earlier than the ability to monitor certainty in the domain of memory.

F24
Reasoning With Make-Believe Truth: Young Children's Object Categorization Based On Pretend Identities

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This research examined young children's ability to categorize objects based on make-believe identities. Preschoolers watched as an adult pretended with three objects (two objects were substituted for the same thing). Then children were asked to show which two went together in pretense. When three distinct, familiar objects were used, 3-year-olds responded at random, whereas 4- and 5-year-olds successfully sorted the objects based on pretense, suspending objective truth. However, 4-year-olds' ability was limited: If there was a competing categorization choice from reality (e.g., a marker and one of two cars had the same pretend identity), 4-year-olds failed to inhibit the reality-based sorting. Despite their difficulty in the initial experiment, 3-year-olds could categorize objects based on make-believe truth in certain situations, such as when realistic support was provided as an anchor and when blocks with ambiguous functions were used. The results reveal developing symbolic competencies in young children's representations of others' pretense.

F80
In A Manner Of Speaking: Verb Learning Patterns In English, Spanish And Japanese Preschoolers

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When do children use language specific cues to in verb learning? English, Japanese and Spanish speaking 3 and 5-year-old were shown a video of an animated star performing a novel manner across a novel path (for example, spinning while going over a ball) as it was labeled with a language appropriate novel verb. They were then asked to extend that label to one of two videos in a split screen (same manner or same path as training). Subsequent trials also tested for mutual exclusivity of that label. There were no significant differences between languages at age 3, but by 5 children followed different labeling strategies. In particular, English speakers were more likely to label the manner of the action and use mutual exclusivity than Spanish or Japanese speakers. These findings shed light on how individual language differences might lead to differential word learning strategies.

F22
Imitation Of Animate Versus Inanimate Agents In Seven-Month-Old Infants

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Adults robustly perceive others' actions as goal-directed. Looking-time studies indicate that infants share this propensity. These findings raise two issues: (1) Is infants' analysis of goal-directed action evident in overt responses as well as looking-times? There have been informative dissociations between the knowledge expressed by infants in these two modalities. (2) Do infants assume that people, but not inanimate objects, are agents? Looking-time findings (e.g. Luo & Baillargeon, 2005) suggest that infants may be more open-minded than adults about the possible forms agents may take. We assessed 7-month-old infants' propensity to imitate the goals of either a human hand or a self-propelled box, like the one used in Luo and Baillargeon's experiment. Infants imitated the goal of the hand, but not that of the box. Thus, infants' analysis of action goals is evident in their overt responses, but different response modalities may reflect different aspects of infants' action knowledge.

F27
Do Monkeys Reason About The False Beliefs Of Others?

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Studies have shown that children as young as 15 months may have the capacity to represent the mental states of others and are able to use these representations to predict the actions of other individuals (Onishi & Baillargeon, 2005). In light of this finding, comparative cognition researchers have begun to study whether non-human primates possess similar abilities. This experiment explores whether primate's capacity to represent other minds includes a capacity to represent other's beliefs. We present the results of two different non-verbal methodologies conducted on the rhesus macaques of the Cayo Santiago Research Facility, Puerto Rico. The monkeys' performance on the two tasks is evaluated in light of the young children's performance on similar paradigms. We speculate that the mechanisms that give rise to infant's mental state attribution may be

shared broadly across the primate order. We also discuss the role of competition in monkeys' performance on these tasks.

S41
From Intuitive To Verbal Mathematics
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There is evidence that three- and four-year-olds from diverse socio-economic backgrounds develop the ability to perform simple "non-verbal" mathematical tasks at the same rate. In these tasks, children watch transformative actions on objects that simulate mathematical statements such as "1 + 2" and predict the result by producing an "answer" with their own objects or by selecting an "answer" represented pictorially. The ability to perform the same mathematical operations verbally, however, appears to develop differentially; specifically, the ability to announce, without reliance on manipulatives, that "one plus two equals three," appears less frequently among lower SES kindergarteners than their higher SES peers. This difference suggests that the transition from pre-verbal to verbal mathematics is somehow sensitive to environmental input. This study examines whether frequency of mathematical talk by teachers in preschool classrooms predicts the development of verbal mathematics among children from lower SES backgrounds.

S80
Development Of A Theory-Based Intervention To Increase Children's Understanding Of Health
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The present, ongoing study examines the effectiveness of a theory-based intervention in increasing preschoolers' understanding and preference for healthy food and physical activity. The two main components of a theory-based intervention are coherence and causality. This study uses a pre-test/intervention/post-test design, and is implemented in three sessions. The pre-test is administered during session one. During session two, the intervention and post-test 1 are administered. During session three, post-test 2 is administered. Children are randomly assigned to one of three conditions: control (e.g., receiving no intervention), non-theory (e.g., receiving the non theory-based intervention), and theory (e.g., receiving the theory-based intervention). Children's understanding and preference are measured by performance on the pre-test and two post-tests. The predicted pattern of results is that children in the theory condition will have significantly higher scores in understanding and preference for healthy foods and physical activities than children in both the non-theory and the control conditions.

S36
A Dynamic System Of Variables Predicts The Transition To Referential Language
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Considering language acquisition as the self-organized outcome of a dynamic system of developmental variables allows prediction of individual children's transition to referential language based on their productivity in mental representation assessed through play observation, phonetic skill and communicative ability. Consistent use of the same consonant sounds over three months of pre-word observation (Vocal Motor Schemes) is shown as necessary but not sufficient for the transition to referential language in the longitudinal study of 20 children. Referential word production is further shown to develop within one month of communicative grunt onset for those children exhibiting Vocal Motor Schemes or referential comprehension for children not phonetically prepared. When longitudinal data for 10 children were examined, it became apparent that in addition to single pretend acts, those children using words referentially also produced representational play combinations.

F72
The Relations Among Age, Neuroendocrine Reactivity, And Memory For A Novel, Stressful Experience.
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The objective of this study was to determine how age relates to memory for a stressful, unique personal experience. 26 children, ages 9-12 (Mean = 10.68), and 30 adults, ages 18-23 (Mean = 19.67), took part in a two-session study. During the first session, participants completed a standardized laboratory stressor during which salivary cortisol and self-report emotional reaction data were collected repeatedly. Participants returned two weeks later for the second session, which consisted of a memory test regarding the former session. Half of the questions asked about central details of the former session, and half asked about peripheral details. Across age, participants were more accurate in recounting central than peripheral details. Also, the adults provided a greater number of correct responses than the children. However, children were not more inaccurate, but instead responded do-not-know more frequently. Subsequent analyses will focus on the differential associations between stress and memory across age.

F61
Comparison And Categorization In Ten-month-old Infants: Can One Trial Do The Trick?
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Previous results suggest that 10-month-old infants' differentiation of horses and dogs in an object-examining task depends on how the items are presented. Infants discriminate these categories when familiarized with pairs of different items, but not when familiarized with pairs of identical items. Experiments were conducted to examine whether a single pair of different items, presented either at the beginning or end of familiarization, would induce sensitivity to the contrast, either by triggering an active comparison process or increasing familiarity with the test context. Results suggest that (1) a single cue or opportunity to compare may not be sufficient to support sensitivity to the category contrast, and (2) the memory demands of a categorization task play a critical role in comparing different exemplars.

F19
Competing Causal Factors Interfere With Children's Explanations For Their Actions
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We explored contexts which led preschoolers to attribute the cause of their action to knowledge that they gained after, as opposed to before, performing their action. For instance, in one context that we labeled 'semantic congruence', children were asked to retrieve cheese to feed a dog. Upon their return, they discovered that a mouse (which is semantically congruent with cheese) had replaced the dog.

When asked to explain the cause of their action, 3- to 5-year-old children erred by stating that they had gotten the cheese to feed the mouse. However, children did not err about the cause of their actions on tasks in which there was no interfering 'post-action' information. In a second experiment, children performed better when asked about the cause of their action in a forced-choice format. These findings are discussed in relation to knowledge acquisition, memory, and inhibitory control.

S58

The Role Of Labeling In An Executive Function Task For Toddlers

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Few studies have examined the development of executive function in children younger than 3 years of age. The goal of this study was to examine the role of differential labeling on an age appropriate variant of the A-not-B task. Sixty-four 2.5- to 3-year old children participated on a computerized version of the mulitstep multilocation search task. On each trial, the correct location was either: (a) not labeled, (b) labeled by the experimenter, or (c) labeled by the participant. We predict that labeling should improve performance as children will have the opportunity to form a linguistic representation of the hiding location. In addition, generating the label should be more beneficial than merely hearing the label because production of language encourages representation that is separable from the experimental context which, in turn, allows for abstract reflection.

S11

Working Memory And Spoken Narrative Comprehension In Young School Age Children

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Contributions of three submechanisms of working memory (phonological short-term memory storage (PSTM), attentional resource capacity/allocation, and processing speed) on the comprehension of spoken narrative by school age children were examined. Sixty five 6-11 year old children completed a digit span task, auditory working memory subtest of the Woodcock Johnson-3 (resource capacity/allocation), simple auditory-visual RT task, and a standardized narrative comprehension test (Test of Narrative Language). After partialling out age effects and receptive syntax knowledge, narrative comprehension significantly correlated with resource capacity/allocation (r = .39) and processing speed (r= -.33). Regression revealed that, after accounting for age and receptive syntax knowledge, resource capacity/allocation accounted for 32.1% of unique variance in comprehension while processing speed accounted for functionally no variance. Results suggest that the attentional resource capacity/allocation submechanism of working memory plays an especially important role in young school age children's comprehension of spoken stories while PSTM and processing speed play negligible roles.

S1

You played with what on where? Infants' understanding of object-surface relations

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One of the hallmarks of Piaget's sensorimotor period is the development of schemas (e.g., reaching and grasping) that will be applied to the environment to solve problems and engage in more complex activities such as the manipulation of objects. When considering infants' object-directed actions and manipulation strategies, the developmental literature on object engagement and exploration during the first year of life proves to be quite rich. However, two aspects of object exploration that have received less attention include: 1) how objects are manually explored in relation to surfaces and 2) how object choices during exploration may vary as a function of surface and object property. This study is an investigation of the aforementioned aspects of object exploration and has been designed to investigate infants' understanding of the relationship between their own abilities and opportunities available though environmental supports (i.e., affordances).

S90

A Computational Account of the Development of Analogical Reasoning: The Role of Inhibition in Working Memory and Relational Knowledge

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We previously reported that when children can identify the critical structural relations in a scene analogy problem, development of their ability to reason analogically interacts with both relational complexity and featural distraction (Richland, Morrison & Holyoak, 2006). Recently we discovered that unlike 3-4 year old American children, Hong Kong children are sensitive to featural distraction, but not to relational complexity. This difference is eliminated when Hong Kong children perform the analogical reasoning task under a working memory dual-task. Here we present computer simulations in a symbolic connectionist model of analogical reasoning explaining these results as trade-offs between inhibition in working memory and the sophistication of relational knowledge representations. Specifically, we show that changes in inhibition in working memory can best explain the overall developmental progression; however, cultural differences are best accounted for by differences in knowledge representation.

F57

Not Just From A To B: How Eye Movements Change Our Understanding Of The A-not-B Task.

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In the canonical A-not-B task, infants are judged on a binary measure of correct/incorrect reaching to the hiding location. Studies examining infants' first looks also use a binary correct/incorrect measure. To investigate the online decision making process, specifically during switch trials, this study eyetracks 9-month-olds throughout a 4-sec search period after the object has disappeared from sight. Looking times to the correct and incorrect well during this search period reveal that infants look more towards the correct well during A trials and later B trials, but are at chance on the switch trials. Infants make more eye-gaze shifts on the switch trial than on initial trials at the A location, or later trials at B. These findings suggest that 9-month-olds are actually capable of finding the correct location (unlike what is found in the manual condition), but have difficulty arriving at a decision during the switch trials.

F76

Infants' Causal Representations Of Intentional And Unintentional Action

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Several studies have found that infants represent human hands as dispositional causal agents. However, it is unclear what features of human hands allow infants to represent them as causal. The current study explored whether infants' representation of human hands as intentional agents is a cue to dispositional causal agency. Experiment 1 showed that 8.5-month-old infants represented a human hand performing intentional actions as the cause of a box's state change. Experiment 2, however, found that infants did not represent the human hand as the cause of the box's state change when they could not represent the hand as performing intentional actions, both when the hand performed an unintended action (backwards flop) and when the surfaces features of the hand were altered (a gloved hand). The results are discussed as they bear on recent proposals suggesting that the development of causal reasoning may be linked to representations of intentional action.

SA

Effect of Beliefs Held by Japanese Mothers on Using Baby Talk Words

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The relationships between using baby talk words in parental speech with their socialization goals, and beliefs regarding parental speech were investigated. Japanese parents (n=62) of 18-month old children responded to questionnaires about using baby talk words in their speech to their children, attitudes on picture-book-reading styles, beliefs about parental' speech to toddlers and parental socialization goals for when their children would be 5-years old. Path analysis indicated that parental interdependent goals concerning socialization were significantly related to empathy orientation of beliefs regarding parental speech. The path analysis also showed empathy orientation of beliefs regarding parental speech was significantly related to using baby talk words. Parental using baby talk words also showed positive correlation with the tendency to read picture-books in empathy-oriented style. These results demonstrate that Japanese parents use baby talk words in relation to their interdependent-empathetic orientation in their belief systems.

F35

The Developmental Progression of Children's Reliance on Symbolic Intentions Over Symbol Iconicity

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The present study examines the contribution of iconicity and intentionality-understanding to symbolic development. Children watched actors add colored dots to a map expressing either symbolic or aesthetic intentions. Previous research showed that 5- and 6-year-olds understand actors' intentions, but when asked which graphic would help find hidden objects, select the incorrect (aesthetic) one whose dot-color matched referent-color, despite that the creator failed to demonstrate symbolic intention. The present study examined older children and the impact of a referent whose color was entirely unrelated to symbol color. Children at ages 5 and 6 systematically picked incorrectly (replicating prior work); 9-year-olds picked correctly; and 7-year-olds showed mixed performance. When referent color matched neither symbolic nor aesthetic dot colors, children performed better overall, but only the oldest universally selected the correct graphic and justified choices with intentionality. Results bear on theory of mind, symbolic understanding, and map understanding.

SA

Individual differences in rule-switching flexibility: A comparison of children's performance on the DCCS and the 3-DCCS

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Individual differences in flexible problem solving are related to different factors such as the ability to shift response strategies according to changing instructions, ability to inhibit prepotent responses, and vocabulary. We tested 3- and 4-year old children on two flexible problem solving tasks: the Dimensional Change Card Sort task (DCCS) and related 3-DCCS (Deák, 2003) along with tests of inhibitory control (finger tapping, grass/snow), and two measures of intelligence (digit span, PPVT-4). Results show that children's performance on the two problem solving tasks are significantly correlated when controlling for age ($r=.71$, $p<.001$). The 3DCCS is also significantly correlated to correct responses on the Grass/Snow ($r=.46$, $p<.05$) and vocabulary ($r=.46$, $p<.03$). The DCCS however was not correlated to any factor. Implications of these results will be discussed

F4

Do Children Infer Ownership From 'Control Of Permission'

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Normal social interaction depends on the ability to reason about ownership of property. But little is known about how children determine who owns what. The current experiment investigated whether preschoolers infer ownership from 'control of permission' -- owners' tendency to decide who is allowed, and who is not allowed, to use their property. Three- and 4-year-olds watched scenarios in which one character asks for permission to play with a toy and a second character either grants or denies permission. Children were then asked which character owns the object. Children at both ages were biased to select the character controlling permission, and did so equally regardless of whether permission was granted or denied. This finding suggests that preschoolers use control of permission as a cue when determining ownership.

F2

Optimal Contexts And Trajectories Of Change In Kindergarteners' Academic Participation And Regulation Strategies

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The developmental trajectories of 68 kindergartners' academic participation and regulation strategy selection and use across the school year in teacher-directed and student-centered instructional contexts were investigated. To assess academic participation and regulation strategies, the children were observed in their kindergarten classrooms during both teacher-led and student-directed activities on four occasions throughout the school year. There were unique trajectories of change in the children's profile of participation and regulation strategy use over the year, in general as well as within and across instructional contexts. Early participation and regulation strategies differentially influenced subsequent patterns of participation and regulation and raised questions about the stability of personal strategy selection and use. Follow-up analyses were conducted to determine if differences in children's use of participation and regulation techniques were artifacts of 'styles' of

interaction or compensatory strategies, and if there were optimal contexts in which some students were better able to implement deeper processing and learning oriented execution/regulation behaviors.

S14
The Development Of Preschoolers' Theory Of Mind And Emotion Understanding

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Emotions, even those at the basic-level, are often discussed as if they belonged to a homogenous category, but in fact, emotions can be divided into two groups: those that require an understanding of others' desires (eg. happy, sad) and those that require an understanding of others' beliefs (afraid, surprised). In the study presented, we assess children's level of belief-desire understanding using Wellman and Liu's (2004) Theory of Mind Scale, and examine how the development of Theory of Mind corresponds to children's understanding of belief- vs. desire-based emotion categories.

F46
The Relation Between Language And Performance On A Low-Verbal False-Belief Task

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The present study examined whether there is a relation between language and performance on a low-verbal (i.e., almost non-verbal) false-belief task. Twenty-three 3- to 5-year-old normally developing children were shown videos of a typical change-in-location task, but without narration of the story. Children's language ability was assessed through: (a) general language ability, as measured by the Test of Early Language Development, 3rd Edition (Hresko, Reid, & Hammill, 1999) and (b) understanding of the language of complementation, as measured by a memory for complements task. Performance on the low-verbal false-belief task correlated significantly with general language ability ($r(22) = .56$, $p = .006$) and had a marginally significant correlation with understanding of complement structures ($r(22) = .41$, $p = .052$). However, these two correlations were no longer significant after age was controlled. These results thus provide some support for the argument that language and theory-of-mind development are inherently interdependent.

FA
Children Trust Speakers with a History of Excusable Inaccuracy

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Three- and 4-year-olds are sensitive to a speaker's past accuracy and avoid learning new information from a speaker with a history of unexplained inaccuracy (Koeing & Harris, 2005). We confirm this, but show that past inaccuracy does not necessarily lead to speakers being mistrusted. A speaker mislabelled the contents of three boxes, either (i) without looking inside, naming the box's expected contents (excusable inaccuracy), or (ii) after looking inside (unexplained inaccuracy). Children (N = 97, 3;8 to 5;8) were prepared to revise their prior, well-founded belief about a fourth box's unseen content, accepting the speaker's contradictory suggestion despite his history of inaccuracy, so long as the inaccuracy could be excused. False belief failers, who understood only why the speaker was wrong on excusable inaccuracy trials (because he didn't see), were no less trusting subsequently than false belief passers, who understood why the speaker said precisely what he did

F52
The Influence Of Motivational Strategies And Attachment Behaviors On Students' Recollection

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A correlational study was conducted with 8- to 12-year-old students to assess the role of motivation and attachment security in recollection. Sixty-five students took home an encoding assignment similar to homework assigned on a regular basis, on which 40 words with corresponding sentences were listed. In class two days later, students were administered free and cued recall tasks, then measures of motivation and parent-child attachment security. A negative correlation between children's performance-focused motivational styles and attachment security was revealed. Students more focused on the perception of their performance by peers were less secure. Moreover, students specifically high in motivation to avoid the appearance of failure recalled fewer items. Results will be discussed as relevant to theories of motivation, learning, and memory in context.

S50
Two Measures Of The Development Of The Perception Of Symmetry Axes

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Children and adults use symmetry axes when remembering locations in spatial working memory (SWM). Little research, however, has examined the localization of symmetry axes. Changes in the precision with which children perceive symmetry axes may explain developmental changes in SWM. Furthermore, conflicting research exists about whether response type influences accuracy during different spatial tasks. The current study examined the development of the perception of the midline symmetry axis and whether performance differed between motor and verbal responses by testing how well 3- to 6-year-olds were able to perceive the midline symmetry axis in a discrimination task. In the task a smiley face appeared at various locations on a large monitor and children made judgments as to which half of the screen the face was shown. The youngest children performed above chance and performance improved as age increased. Additionally, performance was the same in both the motor and verbal response conditions.

FA
Promoting Early Abstraction to Promote Early Literacy and Numeracy

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A learning set procedure was used to teach the oddity principle, insertions into series, and number conservation to 85 kindergarten children who did not grasp these abstractions. Two hundred fifty-five children in control groups were given lessons in kindergarten literacy, numeracy, or art is sessions matched in timing and extent. The children taught the principles of abstraction early in the school year were a match in literacy at the end of the year for those taught literacy and a match in numeracy for those taught numeracy. They

surpassed the literacy group in numeracy, surpassed the numeracy group in literacy, and surpassed the art group in both. This indicates that improving the children's mastery of the abstract thinking involved in oddity, insertions, and conservation facillitated a broad improvement in mastery of kindergarten material.

F44
The Life And Times Of An Infant Memory: Monitoring Encoding, Consolidation, Storage And Retrieval

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Using elicited imitation of novel multi-step sequences we are examining the contributions of encoding, consolidation, storage and retrieval on the 'life' of an infant's memory. Sixteen, 20-, and 24-month-olds are shown 2-, 3-, or 4-step sequences, respectively, and then are given the opportunity to imitate. For half of the events, encoding is free to vary (to determine the contribution of encoding on long-term memory), and for the other half of events encoding variability is eliminated by bringing infants to a criterion level of learning. One week later, infants are re-tested as a measure of the success of consolidation. One month later, storage and retrieval are teased apart by allowing multiple test trials with gradual increases in retrieval cues. This study will allow us to determine the amount of variance in long-term memory that is accounted for by each of the stages in the life of a memory.

F83
Scaffolding Young Children's Understanding Of Symbolic Objects

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Understanding the symbolic nature of objects constitutes a real challenge for young children, challenge that stems from the double nature of these objects: they are physical objects in their own right and, at the same time, they are symbols of the entities they represent. Based on results of a series of experimental studies, we discuss factors that affect the comprehension of symbolic objects (such as scale models, pictures and maps) and their utilization as cognitive tools. We put special emphasis in the role that instruction plays in this process. The acquisition of the comprehension and use of symbolic objects is not solely dependent on age, the scaffolding that adult instruction provides is also crucial at some points in development.

S70
Category Formation In Looking Tasks: A Dynamic Field Approach

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Looking is one of the few behaviors in which infants reliably engage. One challenge for infant researchers has been to understand how infants learn object categories via looking. Several computational models have aimed to elucidate the processes of categorization in looking tasks. These models have highlighted the role of feature distributions in categorization and have effectively captured a range of empirical finding, but they have yet to specify how looking and task dynamics contribute to categorization. In the present report, we present a dynamic field model that learns and forms memories of object details as it looks about the task space via a fixation system. We present simulations showing that the network performs as infants do in canonical categorization tasks. We also show that developments in the precision with which infants represent features along continuous, metric dimensions is sufficient to support selection of the relevant dimensions that reliably differentiate categories.

S75
A New Method For Obtaining Object Similarity Information To Improve The Study Of Categorization Development

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Previous research suggests that 16 to 20-month-old children in a longitudinal training study that were taught categories organized by shape formed a precocious shape bias and acceleration in vocabulary development. However, these studies failed to control the similarity of category exemplars between and within training and testing presentations. This is in part because there is no good way to get this information about multiple exemplars of categories using real world objects. To this end, we developed a method that asked adults to place such objects on a table according to similarity so that we could create sets of more and less similar exemplars in order to examine the role of category structure on the development of the shape bias and vocabulary growth.

S74
Increasing Reference Frame Stability Helps Two-Year-Olds Correctly Search In The 'Ramp Task'

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This study investigates how young children's increasingly flexible use of reference frames enables accurate search for hidden objects by using a task that three-year-olds have been shown to perform with great accuracy and two-year-olds have been shown to perform inaccurately. In this task, an object is rolled down a ramp, behind a panel of doors, and stops at a barrier visible above the doors. We gave two-year-olds a strong reference frame by increasing the relative salience and stability of the barrier, and found that they could now successfully locate the hidden object. This work questions past accounts of object representation that rely on thinking of the child as bringing the equipment (such as knowledge) to solve such a problem to the task in that it suggests the setup of the task itself is what causes performance differences during transitional phases in the development of cognition.

FA
How do different types of concrete objects affect children's developing counting skill?

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This study examines how different types of concrete objects affect children's early math skills. Prior research suggests that realistic objects may not be helpful for learning abstract math concepts (Uttal et al., 2002). Such objects may interfere with learning because they are more perceptually rich (Sloutsky et al., 2005), or because they activate inappropriate prior knowledge (McNeil & Alibali, 2005). Previous studies have not distinguished between these two factors. The present study examines how these two factors influence children's developing counting skill. Children (M age = 3) are randomly assigned to count one of four types of objects in a 2 (perceptually rich or not) x 2 (prior knowledge or not) factorial design. All children participate in the same two counting tasks,

which have been widely used to assess children's knowledge of counting. Results will provide valuable information about how concrete objects affect developing knowledge.

Can You Do What I Do? 18- But Not 14-month-olds Learn To Categorize By Kind Through Cognitive Imitation

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Although much imitation research addresses children's actions, surprisingly little research has investigated cognitive imitation, whereby children must learn to represent behaviors in the absence of external cues. Subiaul et al. (2004) demonstrated that rhesus macaques learn to retrieve food rewards through simultaneous chaining more quickly through observing an expert than trial and error. Our study addresses whether toddlers can also learn cognitive skills, such as categorization, by observing and imitating adults. Fourteen- and 18-month-olds observed an experimenter either touch or explicitly sort pairs of toys by kind. Infants were then given two boxes to put the toys away. Although 14-month-olds handled the toys randomly, 18-month-olds who had observed explicit sorting were more likely to imitate both the experimenter's method (i.e., order of toys placed in boxes) and goal (i.e., which box toys were placed). We interpret this as evidence that toddlers can begin to learn cognitive skills through imitation.

S24

Drawings As Representations: The Role Of Executive Function

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False drawing studies have demonstrated that children have difficulty understanding the relation between a representation and its referent (e.g., Thomas, Nye & Robinson, 1994). Some research has suggested that allowing children to be active in creating the drawing improves their ability to treat a representation as an object in itself (Kamawar & Wilson, 2004). Further, recent work has examined this ability in relation to executive functioning (EF) (Sabbagh, Moses, & Shiverick, 2006). The current study examines the contribution of these two factors to performance on a version of the false drawing task. Preliminary analyses with 30 children (aged from 42 to 72 months, mean = 57) reveal fairly good performance regardless of who creates the representation. However, EF measures (working memory and inhibitory control) predicted performance only when the child created the representation. Currently, additional data is being collected. Final analyses will be presented and discussed.

F3

Leaping Into Imagined Worlds: Mental Model Formation In Preschoolers' Narrative Comprehension

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Previous research suggests that adult readers form mental models of the situations and characters described in a text (e.g. Bower & Morrow, 1990) leading them to imagine that they are in the narrated situation (Zwaan, 1999). We explored 5-year-olds's ability to adopt the affective perspective of a character by measuring children's reaction times in a computerized story listening task. Children listened to a story one sentence at a time and were asked to press a button to hear the next sentence in the story. Children sped up their button presses when the character was feeling excited relative to when the character was feeling trepidation, thus suggesting that 5-year-olds adopt a character's affective perspective. This study contributes to our understanding of the development of narrative cognition.

S17

Whose Gaze To Follow? 14-month-olds Can Track The "reliability" Of A Looker

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A considerable debate exists concerning infants' understanding of the referential nature of gaze. We examined whether 14-month-olds (n = 24) understand that gaze is subjective by observing whether infants' gaze following varies as a function of the reliability of the looker. Infants first observed an "unreliable" experimenter express excitement as she repeatedly looked inside an empty container. Then, infants followed a second experimenter's gaze to a target object behind and in front of a barrier. Results revealed that infants followed the experimenter's gaze to the target behind the barrier (M = 1.88, SD = 0.95) more often than in front of the barrier (M = 1.25, SD = 0.99, p = .03). These data contrast with a previous experiment in which the unreliable looker was the same across both tasks. These findings suggest that 14-month-old infants adapt their gaze following as a function of the reliability of the looker.

F88

Children's Arithmetic Principle Knowledge

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This poster will review the extensive research on arithmetic principle knowledge, focusing on Commutativity and Inversion. Studies in this literature are motivated from various perspectives, such as educational application and cognitive theory. Perhaps because of this, these studies often vary ways that make direct comparisons difficult. This includes age of participants, context of the arithmetic (e.g., symbolic or word problem), and how knowledge is evaluated. Each of these factors is likely to influence the outcome of a study and have its own theoretical implications. What may appear to be conflicting findings can sometimes attributed to differences in one of more of these factors. This poster will focus on characterizing general developmental trends for each of these principles, and will highlight how different methods of evaluating children's knowledge may affect conclusions. Implications for further investigations of children's arithmetic principle knowledge will be discussed.

Categorical Differences in the Development of Category Learning

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In category learning of one-dimensional rules, most preschool children are slow compared to older children. With the application of statistical models that account for individual differences we will show that the efficiency of the learning process is a categorical difference. It appears that the slow learning process (mostly seen in young children) is an all-or-none learning process and not an incremental learning process. The more efficient learners (mostly older children and adults) are testing hypotheses (Schmittmann Visser & Raijmakers, 2006). The categorical, developmental change of learning skills has implications for the way children respond to the

different task aspects. For example, the nature of the specific rule to be learned in a category-learning task becomes less relevant with increasing age. Also for infants we will show that there exist categorical individual differences in category learning. That is, there are slow, but steady learners, there are frequent switchers between knowing and not knowing, and there is a group of inflexible subjects that mainly focuses on irrelevant details.

F50

What Role Do Objects Play In Children's Memory For Locations?

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This study examined how objects affect children's and adults' memory for location. Nine- and 11-year-old children and adults learned the locations of 20 objects marked by dots on the floor of an open, square box. These objects were grouped into four semantic categories: animals, clothing, food, and vehicles. All objects belonging to the same category were placed together in the same quadrant of the box. After participants learned the locations of all 20 objects, the dots marking the locations were removed and participants were asked to place either the original objects, different objects, or cardboard dots where they remembered the previously learned objects to be. When replacing the original objects, children and adults exhibited more categorical bias than when placing different objects or dots. This suggests that the objects themselves play a critical role in memory for locations. This provides further support for the idea that "what" and "where" information are closely linked in memory.

S59

Children's Use Of Proper Names As The Basis For Inductive Inference.

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How do children understand shared proper names (PNs)? Coincidentally shared PNs do not imply shared meaning; but when two toys depict the same individual, they share a PN in virtue of shared character identity. We used an inductive inference paradigm to investigate children's understanding of shared PNs. Preschoolers were shown two toy monkeys (a target and a name-match) that shared a PN, either coincidentally (Accidental-PN condition) or in virtue of representing the same character (Character-PN condition). Children heard a property of the target individual and were asked to extend it either to the name-match or to a third monkey that was similar in size and shape to the target. Children in the Character-PN condition chose the name-match at a significantly higher rate than those in the Accidental-PN condition. This result suggests that preschoolers are sensitive to the context in which a PN is shared between objects.

S16

Categories Influence Children's Predictions About Individual Consistency

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Previous research suggests that preschool children are less likely than adults to use their knowledge about individuals' past experiences to make predictions about the future. In three studies (total n = 138), we document that category information influences whether children expect individuals to remain consistent over time. Results demonstrate that preschool children expect psychological properties (preferences and fears) to remain consistent over time when they learn that the distribution of these properties correlates with category memberships (e.g., when different-gender children or different-species animals have different properties), but not when they learn that these properties fail to correlate with category memberships (e.g., when same-gender children or same-species animals have different properties). Older children and adults incorporated information about animal species, but not human gender, into their inductive reasoning. Results suggest the importance of considering how children's theories about the relation between categories and behavior influence the development of social cognition.

S19

Children's Use Of Linguistic Cues To Animacy In Categorizing Atypical Animals

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Children are adept at making distinctions between animates and inanimates based on clear perceptual distinctions. Less is known about how they make these distinctions with ambiguous cases; these may be situations where children rely on other sources, such as parents. In prior research, we investigated the ways that parents talked about "typical" (fish) and "atypical" (sea urchins) animals with their children at an aquarium. We found that parents were more likely to attribute intentional verbs to the typical animals, and tended to use the pronoun "he" for typical and the pronoun "it" for atypical animals. To understand how children interpret these potential animacy cues, we are currently conducting a study in which children either hear "he" and intentional verbs or "it" and non-intentional verbs while watching videos of atypical animals. We will present data addressing the question whether hearing "he" and/or intentional verbs guide children to conceptualize something as animate.

S77

Gender, Science, And Informal Learning

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Research on student interest in science in the United States suggests a gender gap in the scientific aspirations of adolescents (e.g., Jacobs et al., 2002). An increasing number of informal science education centers have made it their mission to increase public engagement with science through hands-on activities and interactive exhibits. We report on an investigation of visits to an informal science education center housed in an active gravitational-wave observatory. Students participated in hands-on physics experiments, interacted with hands-on physics exhibits, and learned about ongoing research through movies and presentations by staff scientists. We surveyed students' attitudes toward science before and after their school visit, and videotaped their interactions while at the science education center. Here we examine whether particular behaviors (e.g., asking questions) are associated with individual differences among students (e.g., knowledge of physics, interest in science), and whether such associations vary by gender.

S10

Can Young Infants Form Expectations About Associated Object Properties Based On Knowledge Of Perceptual Similarity?

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Infants' ability to categorize perceptual features has traditionally been examined using novelty preference paradigms. The purpose of our studies was to examine whether 6- month-old infants can use their knowledge of perceptual categories to additionally form expectations about associated object properties. Infants were habituated to sets of novel objects that were identical along one perceptual dimension (e.g., shape or colour) and moved along a constant trajectory (e.g. up and towards the upper corner of a display). In a subsequent test phase, infants were presented with objects that either complied with the associations formed during habituation (i.e., same feature and trajectory) or violated these associations (e.g., same feature, different trajectory or different feature, same trajectory). It was found that infants could form expectations about the trajectory of an object set when objects were categorized by colour. Conversely, infants were unable to form category expectations when objects were grouped together by shape.

S13

Can Physical Activity Impact Cognitive Development?

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Motor and cognitive development has traditionally been studied independently from one another, regardless of their similarities. The relationship between the two systems should be studied as recent research has shown direct evidence for the benefits of exercise on cognition in older adults. However, the impact physical activity has on cognitive development in children remains unclear. Can participation in organized physical activity facilitate cognitive development in children? Our current research program examines the impact of intense gymnastics training in 5 - 8 year old girls, as well as, the direct effect of gymnastics training on 5 - 6 year old girls during an 8-week intensive gymnastics training program. The results of these studies will inform researchers of 1) the malleability of working memory, and 2) the role of the sport environment on cognitive development.

F74

Gesture Ability In Children With Perinatal Lesions (PL): Relation To Language And Gesture

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This study examines whether gesture abilities are more related to language abilities or hand-motor abilities in children with pre- or perinatal unilateral brain lesions (PL). Each child's gesture and speech was assessed based on spontaneous parent-child interactions between 2 and 4 years of age. In addition, each child was given standardized language tests and manual-motor tasks during the preschool period. Results show that speech and gesture pattern together, but that some children show dissociations between hand-motor ability and speech/gesture. We find dissociations in both directions: weak motor skills combined with strong speech/gesture and strong motor skills combined with weak speech/gesture. These findings suggest that, in PL children, gesture remains tightly linked to language production. However, it may dissociate from motor ability.

F60

How We Talk About 'Where': Children's Use Of Symbolic Representations To Communicate Spatial Information

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People communicate spatial information using a variety of symbolic representations, including gestures, words, and maps. In this study, we examine important developments between ages 5 and 10 in the usage of the various communicative techniques for conveying spatial information. We also examine how the use of these different communicative techniques may affect how we mentally represent space. Participants learn the locations of six targets by navigating a novel space and are prompted to communicate information about the location of each target. Participants' communications are videotaped and then are coded with a focus on whether and how the locations of the targets are conveyed. Both gestures and maps may influence children to think about the space in a more survey-like way.

F49

Effects Of Infant-Directed Vocalizations On Subsequent Face Preferences

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Both infant-directed speech and infant-directed song are highly effective in engaging infants' attention from the time of birth, regardless of language, culture and prenatal experience. Here we show evidence that infants' social preferences are affected by the presence of infant-directed vocalizations: After viewing a video clip of an individual speaking in an infant-directed way, 5 month old infants subsequently looked longer to a static, silent display of that individuals' face than to a similar image of a novel face. In contrast, after viewing a clip of an individual speaking in a adult-directed way, infants subsequently preferred a novel face to the familiar face. Results suggest that infants selectively engage with people based on their prior behavior.

S83

Children's Understanding Of Teaching And Learning: Links Between Knowledge And Practice

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Recent findings suggest that children's understanding of the goal of teaching and their beliefs about what is necessary for learning to occur undergoes extensive development over the course of the preschool years (Schaefer & Markson, 2007). A natural question that arises concerns the relationship between children's conceptualization of the teaching and learning process and their teaching strategies. More specifically, do children's teaching strategies reflect their knowledge of teaching and learning? We are currently exploring this issue. Using a within-subject design, the same 3- to 5-year-old children tested in the previous studies, are taught a novel board game, and are then instructed to teach the game to a peer. Children's teaching strategies (e.g., explanations, demonstrations, etc.), and the relationship between children's knowledge of teaching and learning and their teaching strategies, are assessed. It is expected

that there will be reliable links between how children conceptualize teaching and learning, and their teaching strategies.

F5

Credibility Assessment Of Misinformed Vs. Deceptive Children

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This is the first study to contrast how adults make credibility assessments about children who experienced a suggestive interview, children who had been coached to lie, and children who were telling the truth. Nine preschool children were interviewed about an event involving a minor infraction. Three of the children reported the truth, four were coached to lie, and two children reported misinformation as the result of a suggestive interview. Eighty-seven college students watched videotaped interviews of these nine children and assessed their credibility. Children who had experienced a suggestive interview were rated as credible as those who were telling the truth. Children who had been coached to lie were rated as less credible than the two groups of children. The results suggest that misleading information gets incorporated into children's memory, thus arguing for a cognitive rather than social explanation of suggestibility. The implication for children's court testimony and jury decisions are discussed.

S68

What It Means To Remember: Children's Reports Of Their Earliest Memories

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Although much is known about the nature of adults' earliest recollections, relatively little has been established regarding children's first memories. This dearth of information limits our understanding of the maintenance and loss of early memories across childhood. Children in pre-kindergarten, first, and third grades participated in this investigation, which examined age-related differences in earliest memories. Prior to requesting their memory reports, interviewers elicited participants' understanding of what it means to remember (as opposed to merely know of) an event and then assisted them in understanding the distinction, thus providing scaffolding that is absent in previous research. The findings provide evidence that the understanding of autobiographic remembering continues to emerge across the early elementary school years. Further, compared to younger children, older children tend to recall more recent life events. This may reflect older children's ability to appreciate the request to remember past experiences--not to merely report known events.

S23

Finding The Middle Ground: Does Language Help Children Reason About Spatial Relations?

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Evidence suggests that young children have difficulty reasoning about spatial relations, although language can facilitate their performance in spatial relational tasks (Gentner & Loewenstein, 2005). Given this, of particular interest is their understanding of the concepts middle and between. Whereas most spatial relations encode a figure's relationship to one ground object, middle and between encode location with respect to two or more ground objects (they are hyper-relational). The present research asks: 1) when do children gain the ability to use the middle relation, 2) is the advent of this ability related to knowledge of words like "middle" and "between," and 3) if so, what is the nature of this relationship? Preliminary data suggest that children begin using middle between 3.5-4.5-years-old, and that the appearance of this ability is related to word knowledge during this same period. Continuing research will investigate the role of language in the development of the concept.

F87

Predicting Early Language Comprehension through Assessment of the Home Literacy Environment

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Prior to language production, the earliest linguistic competence is evident in language comprehension. Of interest in the present study is the relationship between social-pragmatic practices in the home and word comprehension in the second year of life. The home literacy environment (HLE) provides a context in which social-pragmatic factors may guide infants' focus to word-referent relationships. However, studies of the relation between the HLE and receptive language have yielded inconsistent findings. One reason for these inconsistencies may lie in the definition of the HLE. We predict that a broadly-defined HLE, incorporating social-pragmatic factors and specific literacy practices, will account for significant variance in receptive language. To test this prediction, the HLE (narrowly- and broadly-defined) will be regressed onto behavioral and parent report measures of vocabulary comprehension. Data collection is in progress. We anticipate reporting on a preliminary sample of 30 infants from 16 to 20 months of age.

F21

Analogical Transfer: The Influence Of Fantasy, Media, And Time

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We often assume that children transfer information learned in books and DVDs to real world problems. However, recent research suggests that children may be more likely to transfer information from stories with realistic characters than fantastical characters. This research has focused on children's transfer from storybooks in one-on-one interactions. To more closely replicate children's classroom experience, preschool, kindergarten, and first-graders will be tested for their ability to transfer solutions of physical and social problems presented to their classroom through a book or a DVD. In addition, some classes will be exposed to a fantastical story whereas others will be exposed to a realistic version of the same story. Finally, the differences between children's transfer will be examined over 3 time conditions: same day, one week, and two week transfer.

F42

Action Understanding And Social Responsivity In Seven And Nine-month-old Infants

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Research on infants' encoding of intentional action in looking-time paradigms as well as on their early developing competencies in social interaction has made significant progress in the last few years. However, very little is known about the developmental relation between social understanding and social responsivity. We report on

first results of an ongoing longitudinal study of N=96 infants who were first tested at the age of seven months and are being followed up in two-to three month intervals with a large set of looking-time and social interaction tasks. In the present poster, we will report findings from the first two measurement points, at seven and nine months, focusing on the relation between infants' representation of human goal-directed action, their ability to engage in dyadic and triadic social interaction, and their reactions to a disruption of ongoing social interaction in the still-face paradigm.

S48

Infant Preferences For Culturally Familiar Music

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Newborns and very young infants prefer the structures of their native culture such as their language (Moon, Cooper & Fifer, 1993) and faces of their own race (Kelly et al., 2005). Music is a ubiquitous, culturally-specific stimulus, yet little is known about infants' preferences for culturally familiar music. Meter is a fundamental aspect of temporal structure in music that constraints the organization of rhythmic patterns. Whereas in Western music meter is consisted of mostly simple ratios, complex meters predominate in Middle-Eastern music. In order to test infants' responsiveness to culturally familiar music, 6 month-old North-American infants were presented with pairs of musical stimuli having a contrasting meter: Western-Balkan, or Western-"Alien" (i.e. containing highly complex ratios not found in any musical culture). We found a significant preference for melodies with Western meter over melodies with Balkan and Alien meter. These findings suggest that infants tend to prefer culturally familiar music.

F81

"Weight A Minute": Twelve-month-old Infants' Problem-solving Behavior Reflects Unseen Properties Of Goal Objects

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The ability to represent nonobvious object properties, and use these properties to guide behavior, is a hallmark of human cognition. Infants (n=20) were given the opportunity to directly act on two identical plastic blocks that varied only in color and weight (70 vs. 470 g). On alternate test trials, the heavy or light block was placed on the end of a cloth and infants were encouraged to obtain it. Infants were significantly less likely to pull the cloth to obtain the toy and more likely to engage social communicative behaviors, when the block was heavy vs. when the block was light. Infants' motor approaches and latency to approach also varied as a function of block weight. These findings suggest that by the end of the first year of life infants can represent invisible object properties and use these properties to guide their problem-solving strategies in a novel context.

S26

Optimally Vague Comparisons: How Words Provide Abstract Interpretations

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How does language direct attention to relational properties that are not initially salient? The effect of language may be in its interaction with comparison, a major player in accounts of similarity and categorization. Our studies examined how words foster comparison and allow for relational interpretations of two patterns, ABA and BAA, made up of different objects (from Kotovsky & Gentner, 1996). Naming instances with arbitrary labels (such as "koli") may not foster enough comparison to result in relational generalizations but iconically similar labels ("ko-li-ko" for ABA patterns), do. Even more so, words that carry meaning from past experiences, such as "sharing" for ABA patterns, fostered the most relational interpretations. A second experiment applied the label "sharing" to a variety of ABA patterns ranging from definitively-sharing (girl-toy-girl) to vaguely-sharing (triangle-toy-triangle) to not-very-sharing (triangle-tree-triangle). There appears to be an optimal vagueness that allows the right kinds of past experiences to be compared with the current instance to help children find relevant similarities.

S20

The Persistence Of Pretend Play Into Middle Childhood

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Piaget claimed that children stop engaging in pretend play around the age of 6 as the child's thinking becomes concrete operational. Perhaps because of this claim, pretend play in middle childhood has not received attention in developmental psychology. In Study 1 undergraduates answered a retrospective questionnaire about their childhood pretend play, including their memories of pretend content and its, context and when and why they stopped pretending. In Study 2, parents and/or children aged 5 to 14 filled out time diaries recording the child's daily activities over a one-week period, and diaries were coded for instances of pretend play. The results suggest that for most children pretend play persists well past the age of 6, and that it takes on interesting changes in form over time. Future research should explore the role of pretending in middle childhood and the reasons for its eventual demise.

S49

Working Toward Robust Knowledge Of Experiment Design: Development Of The TED Tutor

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We are developing an intelligent tutoring system to improve 4th-8th grade science instruction, specifically the conceptual understanding required to design and interpret scientific experiments. We are progressing from lesson plans for full-class use by teachers to computer-based, adaptive instructional interfaces for use by individual students. Our development process iterates through a series of increasingly computerized and adaptive modules which include simulations in different domains, diagnosis of students' mastery and misconceptions, and adaptive algorithms that match task and feedback to diagnostic information. We conduct classroom validation studies during each iteration, then provide one-on-one tutoring for those students who do not learn from instruction. Researchers incorporate successful tutoring strategies into the next iteration of the computerized tutoring system. In the end, we aim to have created a instruction and tutoring package that will result in robust mastery of experimental design skills measurable by a variety of internally and externally valid assessments.

F56

Parent-child Play And Autism: Exploring Joint Attention, Recall Memory, Pretend Play And Parents' Commenting style

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The study investigates the relation between pretend play and parents' verbal comments in relation to joint attention and recall memory in a group of children with autism (n=20; CA = 5:9; LA = 2:6, MA = 3:9). They all participated in a free play observation when both duration of pretend play and parents' comments were coded. Joint attention and recall memory were measured separately at the same visit. Pretend play correlated with both recall memory ($r = .50$, $p < .05$) and initiating joint attention ($r = .63$, $p < .01$). Parents' synchronized comments correlated positively with high-level initiating joint attention for the autism group, while unsynchronized comments correlated negatively with recall memory. In sum, spontaneous pretend play is related to both cognitive and social abilities in autism. Parents' comments during play had positive or negative impact depending on their focus.

S86

Baby Einsteins Everywhere: Infants' Learning from Video

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Videos are marketed to the parents of babies as teaching tools, yet very little research has examined whether infants learn from this form of representation. In ongoing research, we are comparing 12-month-old infants' learning from video and from direct experience using three tasks. The first involves infants' perception of addition or subtraction of objects, with the prediction that children will more clearly differentiate possible (e.g., 1 + 1 = 2) from impossible (e.g., 1 + 1 = 1) outcomes for live than for video-presented events. In a second study, we are examining whether infants apply fear expressed toward an object on video to its real-life referent if the real toy is not present during the video. Finally, we are examining whether infants learn words from a commercially available video compared to typical parent teaching. These studies will clarify the value (or not) of exposing babies to educational videos.

F70

Coping With Disappointing Events: The Development Of Temporal Distancing

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Individuals are continually faced with positive and negative events. Previous research has shown that adult participants change their memories of the past based on their level of self-worth. One memory distortion, subjective temporal distance, helps adults maintain higher levels of self-worth when faced with failure or disappointment. Positive events are kept subjectively closer in time and negative events are distanced away from the self. This temporal distancing has not been previously explored in children. This study examined developmental differences in the perception of time elapsed since negative and positive, naturally-occurring academic experiences. Preliminary results suggest that there are gender as well as self-worth differences in distancing from events. Additional analyses will examine the effects of grade and type of school on children's use of distancing.

F84

Children's Expectations About The Conventional Use Of Words And Gestures

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Previous research has shown, at least indirectly, that young children understand that words are conventions, shared by speakers of their language community. Do children also have expectations about conventionality in other, non-linguistic domains, or is this assumption restricted to words? To address this question, we first conducted a more direct test of children's assumptions about the shared nature of words, and are currently investigating their expectations about conventionality in the domain of gestures. Two- and three-year-olds rejected the use of a familiar unconventional label for a familiar object (e.g., calling an orange "a table"). Three-year-olds also adamantly rejected the use of novel unconventional names for familiar objects (e.g., calling an orange "a blicket"); however two-year-olds accepted these novel names. A similar method is currently examining children's expectations about the use of communicative gestures.

Input Effects on the Development of the Cardinality Principle

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This study examined the effects of variations in input on how children learn about cardinal numbers. A longitudinal study found that children who hear more number word utterances from their primary caregiver at 30 months of age say more number word utterances at that session and at 38 months of age. In addition, parents overall verbal input (tokens and types at the 30-month session) was positively associated with children's performance on tests of counting, cardinal word comprehension, and last-word responding at the 38-month session. The role that parents' gestures play in how children produce and comprehend cardinal number was also examined. Parents providing more gestures when talking about number have children who point more while counting. There was also a trend for children of parents providing more counting gestures to outperform their peers on tests of counting and cardinality eight months after the initial observation.

F17

The Content And Structure Of Emerging Adults' Autobiographical Memories Of Ethnicity-Related Event

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Autobiographical memories play an important function in identity, however seldom have researchers explored memories that people tell about their ethnicities. Thus, the present study examined emerging adults' memories of ethnicity-related events. We investigated whether individuals' ethnic identity schemas were associated with the ethnicity-related memories they told and the meaning they made of these memories. Our analyses identified four general types of memories: Awareness of Difference, Awareness of Under-representation, Experience of Prejudice, and Connection to Culture. The frequency with which the participants told these stories varied by ethnicity and ethnic identity schemas, suggesting an ethnic lens or schema that works to make salient particular types of experiences over others. Our continuing analyses are looking more closely at how the content (e.g., meaning, emotional content) and structure

(e.g., redemptive sequence, coherence) of these narratives vary as a function of ethnicity, story theme, and the age at which the event occurred.

S66
Construction And Validation Of A Parent-Report Theory-of-Mind Scale

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Children undergo dramatic changes in the preschool ages in their abilities to understand their own and others' mental states, Theory of Mind (ToM). ToM has almost always been assessed using laboratory tasks, most typically false belief and related tasks and there is a need for additional methods for measuring ToM. In this current study, parents who have preschool age children filled out a parent-report ToM scale consisting of 75 items and six subscales (e.g., belief, knowledge, perception, intention, desire, and emotion). Following item analysis, a 57-item scale emerged. Internal consistency of the full scale was excellent. The subscales were also found to have high reliability. Significant correlations between age and the full scale were found. We're currently collecting data to assess the scale's validity in relation to standard laboratory ToM tasks as well as test-retest reliability of the scale.

F54
Statistical Information And Category-based Induction In Preschoolers

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This study investigates the interaction between statistical information and prior conceptual knowledge in a category-based induction task. Children and adults were asked to generalize novel properties to different levels of a taxonomic hierarchy after being provided with varying statistical information about the properties. Properties were either internal (e.g., has a camshaft inside) or transient (e.g., has a little scratch on it). Both children and adults made use of the statistical information and showed a high degree of generalization for internal properties. The results for the transient properties were mixed. Adults generalized transient properties to a lesser extent than internal properties, but they still made use of the statistical information provided. Children appeared to make use of statistical information, but the rate of generalization for transient properties depended on the type of stimuli used.

F90
Effects of Punitive Environment on Children's Executive Functioning: A Natural Experiment

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Research suggests children schooled in an environment that uses harsh corporal punishment may learn to suppress their impulse behaviour compared to other children (Talwar & Lee, 2004). This was directly examined by testing children's (N= 63) executive functioning in hot and cold versions of 3 tasks: Gift Delay (GD), Delay of Gratification (DG) and Card Sorting (CS) tasks. Children were from a school which used harsh punitive discipline or a control non-punitive school in West Africa. Overall children performed poorer on hot tasks than cold tasks. There was also a significant interaction between age and school found for the hot tasks. First-graders from the harsh punitive school were less likely to peek in GD, had longer latencies to touch in DG, and higher scores on CS task, but third-graders had less impulse control in GD and DG tasks and lower scores on CS task than the non-punitive school children.

F25
Pragmatic Differentiation In Bilingual Children

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The current study examines pragmatic differentiation, the ability to use two languages appropriately in different contexts, in young bilingual children. Previous case studies of a few bilingual children in naturalistic interaction have suggested that this ability comes in early, but have not shown a definitive understanding. In our task, children are asked to label pictures first with a monolingual speaker of one of their languages followed by a speaker of their other language. Familiar objects for which children know both translation equivalents will be pictured, ensuring that children can make a language choice. Their appropriate use of the two languages in the two contexts will be measured. English/Marathi bilingual children aged 2-4 will be included. We hypothesize that children will be sensitive to their interlocutor's language, using them differentially. Older children may be more capable of using the appropriate language with each speaker.

F30
Is The Relationship Between Vocabulary Size And Fast Mapping Domain Specific?

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Fast-mapping refers to the ability to learn word-referent correspondences after only a brief exposure to the word. This ability may not emerge simultaneously across word domains. For example, in comparison to the acquisition of other word types, the acquisition of color words is protracted and errorful (Bornstein, 1985). This evidence suggests that fast-mapping is not domain general: fast-mapping of certain word types, like nouns, does not extend to all other word types, like color words. Previous research has linked a productive vocabulary of five or more color words with a dramatic increase in performance on color learning/categorization tasks (Kowalski & Zimiles, 2006). This present study examines whether experimentally manipulating the size of children's color lexicon can lead to the fast-mapping of color words. Children, with very limited color word knowledge, were trained in two, four, or six color words then tested in their ability to learn four untrained colors after only a single labeling session. Results show that children trained in six color words out-perform children trained in two and four color words. Thus, it appears that fast-mapping of color words occurs once a critical color vocabulary level has been reached--in this case, five or more words.

Infants' Response to Indirect Emotional Information: The Role of Emotional Referent

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An experiment was conducted to explore the conditions under which infants use indirect emotional information to regulate their behavior. Seventy-two 18-month-olds each watched an Experimenter demonstrate an action on an object (twice). Another adult (the Emoter) entered the room and watched a third demonstration. The Emoter subsequently either expressed Anger (Anger-Experimenter condition) or Neutral affect (Neutral-

Experimenter condition) toward the Experimenter or expressed Anger about something in a magazine (Anger-Magazine condition). Then, the Emoter became silent and neutral and turned toward the infant. Infants were given 20 seconds to play with the object. As in earlier studies, infants in the Anger-Experimenter condition were less likely to play with the objects than were those in the Neutral-Experimenter condition. There were no differences between the two Anger conditions. The findings will be discussed in terms of infants' understanding of referential intent, the relevance of Anger in each condition, and alternative explanations

S40

Children's Emergent Understanding Of Letters As Symbols

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Researchers disagree about the value of concrete objects in children's development and education. We hypothesized that play that emphasizes the symbolic properties of letters will promote children's understanding that, although letters are in one sense arbitrary symbols, a specific letter represents a sound and is fixed in terms of its placement in a word. We found that the ability to gain knowledge from this type of guided symbolic play appeared to be dependent on a child's developmental stage and understanding of letters. Children who had higher letter knowledge were able to learn from the concrete objects and gained a greater understanding of how letters can be used as symbols. Children who are developmentally ready may truly benefit from symbolic play with concrete objects and may gain insight into the need to use letters as symbols for sounds.

FA

Theory of Mind, Inhibition and Language: One Process or Many?

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Knowing other's beliefs and perspectives presents an advantage in social situations. If theory of mind (ToM) development can be facilitated by other constructs, such as language or executive function, understanding their relationship is critical. Three, four, and five-year-old Spanish speaking children were tested on multiple ToM, inhibition and language tasks to uncover how they interact in development. Tasks included the TVIP (equivalent to the PPVT), 2 appearance-reality tasks, 4 false belief tasks and verbal and motor inhibition tasks. A multiple regression analysis revealed that motor inhibition tasks were more predictive than verbal inhibition tasks of performance on ToM measures requiring either a verbal or a motor response. These findings indicate that performance on ToM tasks may be mediated by other cognitive skills.

S2

Words As Representations: The Role Of Inhibitory Control And Working Memory In The Moving Word Task

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Bialystok's moving word task (MWT) has repeatedly shown that pre-reading children do not treat written words as stable representations. It is unclear, however, whether this finding reflects a true deficit in children's understanding of print as a form of representation, or whether it results from the inhibitory constraints of the task itself. As such, Collins and Robinson (2003) developed a modified MWT with reduced inhibitory demands by first presenting the printed word adjacent to a non-matching object, and then moving it adjacent to a matching object. The current study examined the relationship between children's performance on the standard MWT, the modified MWT, and measures of conflict inhibition, short term and working memory. While the reverse moving word modification was found to facilitate children's performance on the task, our findings do not support the role of executive inhibition in the standard task.

S27

The Role Of Contextual Change In Young Children's Category Learning

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The encoding specificity principle states that the recollection of an event, or a certain aspect of it, depends on the interaction between the encoding and retrieval contexts. Generally, optimal retention occurs when there is high similiarity between the encoding and retrieval contexts. The current investigation explores (a) the existence of the encoding specificity principle in children, (b) the application of the principle to categorization, and (c) the role of contextual change in young children's object and category learning. We predict that the encoding specificty principle will not only play a significant role in young children's learning, but can be used to study the role of context in categorization, which has long been noted as of high importance, but rarely empirically investigated.

F28

Timing Influences Young Children's Object And Category Learning

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The spacing effect, an empirically robust phenomenon in adult memory research, states that distributed presentations, occurrences separated by the passage of time, are a more effective learning method than massed presentations, occurrences of immediate succession. Although there is extensive research on the spacing effect in adult research, this principle is rarely incorporated into research and practice with children. To address this lack of research, the current investigation explores the spacing effect's role in children's abilities to learn objects and categories. Young children will be given both massed and spaced presentations for novel objects in typical object and category learning tasks. We predict that spaced presentations, as compared to massed presentations, will be more beneficial for children's memory of objects. The results of this study will have a range of implications, such as developing educational curriculum and choosing paradigms for research methods.

S53

Older 2-year Olds Learn From Others' Mistakes In A Cognitive Imitation Paradigm

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Research has demonstrated that young children have trouble making sense of incomplete or inaccurate information and, as a result, fail to learn from others' mistakes. However, such studies confound motor-spatial abilities with imitative competence. To exclude this confound, we used a cognitive imitation paradigm to explore the ability of 24-29 and 30-35 month-olds to learn from a model that either demonstrated a correct or incorrect sequence.

Despite the difficulty of the task, older 2-year olds (but not younger 2-year olds) learned the correct serial order of pictures in both demonstration conditions. This study shows that the ability to learn from incorrect or incomplete information--a significant cognitive milestone--develops in the second half of the second year of life.

S54

A Comparative Approach To Quantity Perception In Infancy

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Research on the development of numerical cognition has been conducted in human infants, as well as across different species (e.g., rats, pigeons, monkeys), but the lack of similar methodologies makes comparison difficult. Using methods analogous to those previously used with rats, we are further investigating the existence of evolutionarily preserved mechanisms for representing quantity. Using a visual reinforcement training procedure based closely on work by Meck & Church (1983), 6-month-old infants were trained to associate 2 items with a reward on one side of the screen and 8 items with a reward on the opposite side. After training, test trials examined generalization of intermediate quantites (3, 4, 5, and 6 items). Meck & Church found rats' generalizations were consistent with ratio-based discriminations, such that 4 items were generalized equally toward 2 and 8. The present results with infants are discussed in terms of this same ratio-based system for discriminating quantity.

S34

The Impact Of Generics On Children's Causal Reasoning About Human Behaviors

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Generics (e.g., "Bats live in caves") provide children with evidence that certain categories are richly structured, inference-promoting kinds. We investigated how generics impact children's causal reasoning. Specifically, we examined how 4-year-olds explain human behaviors when asked to do so using either generic or non-generic questions (e.g., "Why do children play football?" vs. "Why is this child playing football?") Our findings show that generics prompt children to explain behaviors in terms of broad, category-general properties or goals (e.g., "to get better at it"). Conversely, specific questions promote a focus on individual motivations (e.g., "because he likes to"). These findings are similar to those obtained with adults and suggest that generics encourage children to reason about behaviors using a distinctive explanatory framework. We are also examining children's responses to questions that refer specifically to gender categories ("boys" or "girls") to investigate the effect of property typicality (i.e., gender-neutral vs. stereotypical) on causal explanations.

F18

Life Story Episodes And Attachment Script Representations

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Recent research on personal narratives and autobiographical memory has emphasized the construction of a narrative that captures an individual's personal experience over time. Researchers such as Dan McAdams have emphasized the importance of a coherent and optimistic life story for long-term adjustment. He and others have documented individual differences in the level of optimism in personal narratives and have argued that optimism arises in the responsive caregiving associated with secure attachment. The current poster explores this possibility by reviewing essays written in a creative writing class that describe significant life experiences in childhood and adolescence. Waters & Waters (2006) have introduced the concept of secure base script in attachment-related narratives. Our poster seeks to illustrate the presence of important aspects of this script in these essays about personal experiences. We propose future research should pursue the suggestive evidence found in these illustrations to formally link personal narratives and attachment.

F69

Preschoolers' Use Of Protagonist Goals To Comprehend Narratives

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In this study 4-year-olds' ability to comprehend character goals within narratives is explored. Previous research demonstrates that whether a protagonist accomplishes his/her goal early or late in a story influences children's memory for the story. This finding suggests that the children maintain in mind an as-yet-uncompleted goal to help them remember why the character was doing what he/she was doing. The present research tests the extent to which preschoolers' understanding of goals is explicit and on-going during narrative comprehension. At several points while hearing a story the children were asked, "Why did she do that?" or "What do you think is going to happen next?" In response to the questioning the children mentioned the ongoing goal in the goal-late condition and attempted to generate goals to explain activities in the goal-early condition, indicating that they maintain goals in mind while hearing a narrative.

S15

Children's Production Of Irony In Two Face-to-face Communication Contexts

Juanita Whalen, Lenka Zdrazilova, Penny Pexman
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Children demonstrate an understanding of ironic language from as early as age 5 or 6 (e.g., Harris & Pexman, 2003) but there has been virtually no study of children's production of verbal irony. The present studies examined children's tendencies to produce ironic remarks in a lab setting and a naturalistic setting. In the lab setting children's responses to an experimenter's ironic remarks following structured stories were recorded, and results showed that children produced irony 9% of the time. In the naturalistic setting children's spontaneous remarks during a game with family members were recorded, and results showed that children produced irony less than 1% of the time. As early as age 5 children produced ironic remarks, yet rates varied with age and testing environment. Differences could be due to constraints imposed by the testing environment and might provide information about the specific cues required for children to use irony in communication.

F16

Preschoolers' Scripts For Basic-Level Emotions: Understanding Causes Vs. Consequences

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Preschoolers are actively acquiring emotion scripts, including the causes and consequences of different emotions. In the current study, stereotypical situational causes and behavioral consequences were presented in separate stories for happiness, sadness, anger, fear, surprise, and disgust. Children's (N = 108, 3 to 5 years) labeling performance was higher for the causes of fear and disgust than the corresponding consequences, but higher for the consequences of anger than its causes. Thus, in acquiring emotion scripts, children may focus on the causes for some emotions and on the consequences for others.

S67

Building Understanding In Under Construction: Can Preparatory Activities Support Collaborative Learning?

Erin Wilkerson, Nora J. Benjamin, Catherine A. Haden
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In a study conducted at the Chicago Children's Museum, we have experimentally manipulated information that was given to parent-child dyads (N > 80; children ages 5-7 years old) in an effort to enhance collaborative interactions and child learning in the "Under Construction" exhibit. Some dyads received information about how to build strong structures, others received information on what forms of conversation might enhance their engagement with the exhibit materials, and still others participated in a simple "draw where you live" task. Effects of the preparatory activities were found, such that families in the building and conversational instruction conditions built stronger structures, and engaged in more elaborative talk while in the exhibit. Assessments of the children's understanding and remembering also illustrate the impact of the preparatory activities on what was learned.

F12

Uncovering Lies; Detecting Children's Deceptive Acts.

Shanna Williams, Sarah-Jane Renaud, Kristine H. Onishi, Victoria Talwar
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Three experiments examined adults' accuracy at detecting lying behavior by both pre-school and school-aged children. In Experiment 1, participants (N = 60) viewed 16 videos of children taking part in a modified temptation resistance paradigm; designed to elicit lie-telling behaviors to conceal a transgression (anti-social lie). Adults were at chance for detecting lying for children at both ages. In Experiment 2, participants (N = 60) viewed 16 videos of children taking part in a modified disappointing gift paradigm; designed to elicit a lie to avoid hurting another's feelings (pro-social lie). Adults detected pro-social lies at above chance levels ($p < .05$). To compare detection of anti- and pro-social lies, participants (N = 22) viewed both sets of videos. Pro-social lies were detected more than anti-social lies ($p < .05$) for children in both age groups. Implications are discussed in the context of theoretical and legal applications.

Comparison of Self-Reflection and Insight between High School and College Students

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The Self-Reflection and Insight Scale was originally developed to measure self-consciousness among adults (SRIS; Grant, Franklin, & Langford, 2002). Three subscales of SRIS assess through self-report the tendency of inspecting one's own thoughts, feelings, and behaviors (i.e., engagement in reflection and need for reflection) and the clarity of understanding themselves (i.e., insight). This study collected responses to the SRIS from 113 10th graders and 122 college students. Factor analysis examined the generality of the scale to 10th graders, which resulted in a similar three-subscale solution. T-tests compared responses between 10th graders and college students. In terms of engagement in reflection and need for reflection, 10th graders were significantly less reflective than college students. However, they rated themselves as equally insightful as did college students. These findings support the applicability of the SRIS to high school students and suggest that the difference between high school students and adults lie in self-reflection.

F85

The Role of Conceptual and Associative Information in the Course of Word Learning

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Young children often infer meaning of new words from a context, however, the way the context constrains this process is unknown. In this research we address this issue by using a novel task. During the study phase of the task, participants were presented with a list of 10 familiar words and a novel word ("fep" or "dax"). During the lexical extension phase, they were presented with pictures of novel animals and artifacts and asked to find a dax. There were three between-subject conditions: (a) baseline (none of the words referred to animals), (b) taxonomic (all the words referred to familiar animals), and (c) associative (all the words were semantic associates of the word "animal", such as, "farm" or "zoo"). Adults extended novel words to novel animals only in the taxonomic condition, whereas 4-5 year-olds did so only in the associative condition. These results indicate that associative knowledge is more likely to drive word learning early in development than taxonomic knowledge.

S64

The Role Of Category Distinctiveness And Coherence In Children's Inferences

Tess Young, Simone P. Nguyen
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This study examines the role of category distinctiveness and coherence in children's inferences about cross-classified items. Category distinctiveness is the degree to which membership in a category is rare whereas category coherence is the degree to which members in a category are similar to one another. Children participated in two tasks. In the first task, children were presented with people who belonged to both a distinct category and a nondistinct category. In the second task, children were presented with people who belonged to both a coherent category and a noncoherent category. In both tasks, children were asked to make category based inferences about the people. The results show that 5-year-olds select the coherent category choices, but not the distinctive ones. Adults, however, select both choices. These results suggest a developmental pattern for the emerging use of category coherence and distinctiveness as a basis for inferences about cross-classified items.

How Does Two-Way Traffic Impact Child Cyclists' Road Crossing Behavior In A Virtual Environment?

Christine Ziemer, Jodie M. Plumert, James Cremer, Joseph Kearney
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Previous studies examining bicycling across traffic-filled roads in a virtual environment have examined situations where traffic comes from only one direction. In the real world, traffic usually comes from both the left and the right side and both lanes must be taken into account in order to determine a safe gap to cross. In this study, 12-year-olds and adults rode an instrumented bicycle through a virtual environment consisting of a residential street with 12 intersections. Participants faced cross traffic approaching from both the left and the right-hand side and waited for gaps they judged were adequate for crossing. Preliminary results indicate that adults and especially children have a harder time crossing the 2-way traffic intersections. We explore the different strategies that are used when crossing two lanes of traffic versus one lane.

The Role Of Sensory-Motor Information In Concepts: The Case Of Tools

Elena Zinchenko, Jesse Snedeker
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We examined the role of sensory-motor information in conceptual representations of 5 year olds. Previous research has found that abstract information (such as an object's intended function) is central to older children's concepts in categorization tasks. Perceptual information (such as an object's shape) is more important for younger children (Smith, Jones & Landau, 1996). However, recent evidence suggests that even young children use perceptual information as cue to more abstract properties in categorization decisions (Diesendruck, Markson & Bloom, 2003; Kemler-Nelson, 2000; 2004). Our current work compares the use of motor information and function in the acquisition of novel tool categories in children. Five-year olds were asked to extend a novel word to new exemplars of tools which either required the same motor movement or had the same function as the standard. Children overwhelmingly used the tool's function as the basis for their categorization decisions (75% of function choices). Thus by five years of age, abstract information overrules motor information in the formation of novel tool categories.

Invited Speaker and Symposia Abstracts

The Cognitive Development Society Fifth Biennial Meeting Program includes two plenary invited talks, two plenary invited symposia, and four symposia sessions with three concurrent symposia.

Friday, October 26

8:45 - 9:45	Plenary Talk in Anasazi Ballroom Language and the Infant Brain: How Children Learn Patricia Kuhl, University of Washington		
10:15 - 12:30	Invited Symposium in Anasazi Ballroom In Memory of Esther Thelen		
	Anasazi North	Anasazi South	Zia Ballroom
2:00 - 3:45	New Directions in Social Cognitive Development: It's More than Theory of Mind	Computational Approaches to Language Acquisition: Connectionist, Dynamical Systems and Bayesian Perspectives	Attention to Language: The Interaction between Language and Cognition
4:00 - 5:45	Interactions between Social Cognition and Object Cognition	Rational Statistical Inference in Cognitive and Language Development	The Function of Action in Perceptual and Cognitive Development

Saturday, October 27

8:45 - 9:45	Plenary Talk in Anasazi Ballroom Learning to Perceive to Learn Rob Goldstone, Indiana University		
10:15 - 12:30	Presidential Symposium in Anasazi Ballroom Children's Learning		
	Anasazi North	Anasazi South	Zia Ballroom
2:00 - 3:45	Cognitive Developmental Perspectives on Social Categorization and the Implications for Intergroup Bias	The Role of Comparison in the Development of Relational Representations and Structured Thought	To Model or Not To Model – Is That a Central Question?
4:00 - 5:45	New Directions in Pretend Play Research	Knowing about Ignorance: Children's Judgments and Nonverbal Behavior in the Face of Uncertainty	Learning by Doing: The Role of Exploratory Play in Cognitive Development

Friday, October 26, 2007: 8:45 AM – 9:45 AM

Plenary Talk: Language and the Infant Brain: How Children Learn

Patricia Kuhl, University of Washington

Some of the most revolutionary ideas in brain science are coming from cribs and nurseries. In this talk I will focus on the new discoveries about early learning and the neural coding of learned information with special attention to language. Infants are born 'citizens of the world' and can acquire any language easily. But by the end of the first year of life, they've developed a specialty in one language, and their ability to discern sounds from other languages declines. Research on infants is showing that they use computation to crack the speech code, and that a social interest in language plays an important role in language learning. "Motherese," the exaggerated, high-pitched language we use to speak to infants and children is used in virtually every language studied, and infants' interest in it also contributes to their ability to learn. These precursors to language in typically developing infants are leading to the identification of children at risk for developmental disabilities involving language, such as children with autism. In the next decade, the techniques of modern neuroscience will play a significant role in our understanding of how infants learn.

Friday, October 26, 2007: 10:15 AM – 12:30 PM

Invited Symposium: In Memory of Esther Thelen

Organizer: Linda Smith, Indiana University

Summary: Esther Thelen–through extraordinarily inventive experiments–changed the field's understanding of motor development. She showed developments such as reaching and walking not to be pre-specified but to be the self-organizing products of many heterogeneous processes interacting in a complex system of brain, body, and world. Thelen saw the broader value of these ideas beyond motor development. In celebration of her contributions, the presentations in this symposium consider the broader themes in Thelen's work as they apply to the problem of development generally, and to cognitive development in particular.

Thinking About Development: Reflections on Esther Thelen's Assumptions and Their Application to Developmental Inquiry

Robert Lickliter, Florida International University

This talk considers the development of intersensory perception. The talk will briefly review how Esther's basic assumptions about developmental inquiry are being applied to the study of early perceptual development and more broadly to our understanding of the development of "species-typical" behavior.

Dynamics in Statistical Learning

Rebecca Gomez, University of Arizona

This talk will present research suggesting that learning is a dynamically guided process, arising in the interaction of internal and external pressures. Moreover, learners, and the structure they can acquire, change as a function of experience, and are constrained by fundamental processes of memory. In contrast to "knowledge" constraints traditionally proposed in the literature on development and learning, the constraints proposed here arise naturally from the mechanics of learning and memory processes themselves.

Brain Development as the Ultimate Dynamic systems

Joan Stiles, University of California-San Diego

From the complexities of genetic variation and transcription, to the variable paths of neural development and its dependence on experience, brain development is far more complex and dynamic than is often assumed in debates about nature vs. nurture, nativism vs. cultural learning. Inherited and experienced factors interact constantly in an ever-changing organism. This is a complex, dynamic and self-organizing system.

Weird loops: From object recognition to symbolic play to learning nouns and back

Linda Smith, Indiana University

Cognitive development is also far more complex and dynamic than our usual debates allow. Developmental change is multi-causal in nature, with weird loops of causes which are also consequences and consequences that are causes, with considerable and nontrivial causal spread. The interdependencies among developmental changes in visual object recognition, object substitution in play, and object naming learning are presented as an example.

Friday, October 26, 2007: 2:00 - 3:45 pm

New Directions in Social Cognitive Development: It's More than Theory of Mind

Organizer: Kristina Olson, Harvard University

Summary: Social cognitive development has long been a topic of interest within cognitive development. Most textbooks and handbooks have chapters devoted to the study of social cognition in young children, though examining these chapters one often leaves with a feeling that social cognitive development is limited to the study of theory of mind and intentionality. It is rare to see core topics in social development or social psychology studied from a cognitive developmental perspective.

In this symposium we examine questions that are social, cognitive and developmental in nature and that are derived from other ongoing work in social cognition, social development, comparative psychology and cognitive development. We examine four unique topics—attachment, cognitive dissonance, social attitudes and preference development—using methods and theories derived from cognitive development. Finally, our discussant, Carol Dweck, will provide perspectives on the field of social cognitive development more broadly, emphasizing where the area of social cognitive development has been and where it is headed.

Evidence for Infants' Internal Working Models of Attachment

Susan C. Johnson, Carol S. Dweck, and Frances S. Chen, Stanford University

Nearly half a century ago, psychiatrist John Bowlby proposed that the instinctual behavioral system that underpins an infant's attachment to its mother is accompanied by "internal working models" of the social world—models based on the infant's own experience with her caregiver (Bowlby, 1958, 1969/1982). These mental models were thought to mediate, in part, the ability of an infant to use her caregiver as a buffer against the stresses of life, as well as the later development of important self-regulatory and social skills.

The current study reports the first direct evidence for human infants' "internal working models" of attachment. We used a standard visual habituation technique to assess infants' expectations of a caregiver's responsiveness to bids of attention from a infant during an abstractly depicted separation event. Securely attached infants, relative to insecurely attached infants looked significantly longer when the depicted parent ignored the child's cry and moved farther away from, rather than returning to the child, as though the securely attached infants, but not the insecurely attached infants were surprised to see a parent act unresponsively. These results are clear evidence that infants' interpretations of the social world are influenced by their own histories with their caregivers, as predicted by Bowlby.

The Origins of Cognitive Dissonance

Louisa Egan, Laurie Santos, & Paul Bloom, Yale University

The motivation to reduce cognitive dissonance (CD) between divergent beliefs, attitudes, and behaviors impacts adult cognitions in domains ranging from consumer consumption to morality. Previous work on the origins of CD has relied on induced behaviors, rather than behaviors generated by an individual, and has failed to employ simple and direct tests.

Our work explores CD in young children and capuchin monkeys through a non-verbal variant of Brehm's (1956) free choice paradigm. Children chose between two equally preferred stickers, A and B. Children then chose between the unchosen alternative and sticker C, which was originally rated as preferred as A and B. Children significantly chose sticker C over the unchosen A/B. In a control condition, children saw both A and B and received one of the two. Children then chose between the unreceived sticker and sticker C. In this condition, preference for C is absent.

Similarly to children, in the experimental condition, monkeys chose between M&Ms of equally preferred colors A and B, and then between the unchosen color and C. In the control condition, monkeys saw both A and B and received one of them. Then,

monkeys chose between the unreceived color and C. Monkeys preferred C to the unreceived alternative in the experimental condition, but preferred the unreceived alternative in the control condition.

These results are the first evidence of decision rationalization in young children and animals. They indicate a higher degree of motivational complexity in young children and capuchin monkeys than they are commonly believed to possess.

When do children begin to see lucky people as nicer than unlucky people?

Kristina Olson, Mahzarin Banaji, Elizabeth Spelke (Harvard University), & Carol Dweck (Stanford University)

Random or lucky and unlucky events happen everyday—people win lotteries and lose their houses in hurricanes. We know that young children have a limited understanding of random events (Weisz, 1980) and that even as adults people sometimes blame others for the random or unlucky events that happen to them (e.g., Lerner, 1971). Recent developmental research has indicated that school-aged children demonstrate a preference for lucky people compared to unlucky people (Olson, Banaji, Dweck, & Spelke, 2006).

The current work investigates how preschoolers (aged 2.5-5 years old) think about lucky and unlucky people. In two studies with differing methods we demonstrate that children as young as 3 view the lucky as nicer than the unlucky. The presence of this evaluation at such an early age sheds doubt on explanations provided by social and developmental psychology such as the Belief in a Just World (Lerner, 1980) or Immanent Justice (Piaget, 1932/1965). Other, more cognitive explanations such as affective-tagging or valence matching must be explored to explain this phenomenon.

Positive evaluations of lucky compared to unlucky individuals are important to examine both theoretically and practically. Understanding the mechanism underlying this "preference for the lucky" can help us understand how children develop preferences and attitudes more generally. Practically, we hypothesize that young children's preference for the lucky might lead to other social group attitudes given that some groups (e.g., the poor) tend to experience more unlucky events than others.

Social influences on children's preferences

Lori Markson & Christine Fawcett, University of California, Berkeley

Successfully navigating the social world demands that we moderate the influence of others on our own behavior, without ignoring the importance of others as sources of information in an uncertain world. Even infants are skilled at seeking information from others, especially in the face of unfamiliar events (Campos & Stenberg, 1981). Do young children look to others as resources when determining what to value and developing their own subjective preferences?

The current research investigates whether desirability and scarcity influence children's choices when choosing between novel or unknown items. In one study, we demonstrate that 18-month-old infants' preferences are influenced by the observation that others desire or prefer that entity to another. Further studies are investigating whether infants are differentially influenced by familiar, trusted individuals (e.g., parents), or more similar others (e.g., siblings or peers). A second study asks whether children's choices are influenced by the perception that a given good is scarce. We found that when faced with different quantities of unknown options to select from, three- and four-year-old children tend to choose one of the less abundant item, suggesting they assign higher value to the scarce good. This bias was observed in the absence of a social context. Further studies are examining whether children's choices may have been influenced by implicit social cues (e.g., "If there are fewer of these, other children must have chosen them."). Taken together, these findings highlight the impact of the social world on children's preferences.

Discussant: *Carol Dweck, Stanford University*

Computational Approaches to Language Acquisition: Connectionist, Dynamical Systems and Bayesian Perspectives

Organizer: Sarah Sahni, University of Wisconsin, Madison

Summary: The goal of this symposium is to review the merits of computational approaches to research in language development. There is a rich history of using computational methods to create formal models of behavior which instantiate and test crucial aspects of psychological mechanisms. This approach is powerful because it forces researchers to try to understand the roots of behavior and not simply describe it. It is especially relevant to issues in development as many of these models address acquisition and learning.

As computational research has evolved, connectionist, dynamical systems, and Bayesian models have all emerged as popular approaches. Each is well-suited to investigate learning problems, although they lend themselves to different scientific theories. The symposium will consist of three presentations that: 1) Describe a line of work in language acquisition that has emerged from one of these approaches, and 2) Discuss unique aspects of a particular model and the approach. Each of the speakers is an expert in their field: Eliana Colunga (connectionism), Larissa Samuelson & John Spencer (dynamical systems), and Amy Perfors & Josh

Tenenbaum (Bayesian framework). The discussant, Linda Smith, will draw comparisons among the three approaches and highlight challenges faced by any computational model.
The topic of this symposium is important and timely as computational approaches are once again gaining attention in the field. This symposium will give members the opportunity to understand the unique merits of computational approaches as well as to clarify the different types of models, thereby providing insights concerning the relative strengths of each approach.

Learning to learn words: a connectionist account

Eliana Colunga, University of Colorado - Boulder

Young children's seemingly effortless ability to learn new words, which emerges sometime in the second year of life, provides an interesting puzzle in developmental psychology. The main idea of the Attentional Learning Account of early word learning is that children learn to learn words as they learn words, and that they do so by extracting second-order generalizations from the statistical regularities present in the structure of the vocabularies they are acquiring. The computational model I will present embodies two general principles we know to be part of human cognition and of connectionist models that are well-suited for testing this hypothesis: associative learning and generalization by similarity. Through a series of simulations and experiments with young children, I will show how this model lends insight into how children's rapid word learning develops across different contexts and across different languages. The strengths of this model include its relative simplicity, its modeling of real world regularities, its attempt to make the task of the model approach that of children in the lab, and its ability to make testable (and tested) predictions. I will discuss these strengths in the context of the different computational approaches showcased in this workshop. At the end, I will suggest that 1) computational modeling lends particularly well to the understanding of developmental phenomena, and 2) the choice of computational paradigm and its potential to provide insights may depend more on the hypothesis to be tested than on the relative strengths and limitations of the different approaches.

Language acquisition in a Bayesian framework

Amy Perfors & Josh Tenenbaum, Massachusetts Institute of Technology

On the basis of noisy and impoverished input, language learning infants must acquire both semantic generalizations (how to map world experience onto the words in the input) and syntactic ones (how to group those words into sentences). This mastery, especially in syntax, requires the ability to reason probabilistically about structured representations: grammatical rules depend upon the hierarchical organization of phrases, and knowledge of these rules is not all-or-none. Mastery also requires the ability to learn at multiple levels of abstraction. We see this clearly in the acquisition of the shape bias: on a specific level an infant must realize that toys called 'ball' may have little in common aside from their shape, and on a more abstract level, she must learn that count nouns in general tend to be well-organized by shape and not other features.

Bayesian methods are particularly suited to exploring the mastery of these two important abilities. The Bayesian approach naturally integrates statistical learning and structured representations and incorporates both into a normative framework for rational inference; this allows us to investigate the role of different types of representational structure in a principled and rigorous manner. Hierarchical Bayesian models also learn on multiple levels, making simultaneous inferences about both specific and more abstract hypotheses: as a result, they explain generalizations in a way that single-level learning cannot. We explore these advantages in the context of a model applied to learning about both the shape bias as well as aspects of verb argument constructions.

Keeping it real: A dynamic systems approach to word learning

Larissa Samuelson & John Spencer, University of Iowa

In this talk we will illustrate how we have used a particular computational approach based on Dynamic Systems Theory—Dynamic Neural Field Theory—to understand how young children's knowledge of names and categories is brought to bear in a task in a moment in time. We suggest that only by understanding how individual behaviors at this real timescale accumulate to create later behaviors, can we make progress in understanding the development of word learning biases and cognitive development more generally.

Our recent modeling work captures developmental changes in children's attention to shape from 1.5-to 4-years-of-age in forced choice and yes/no tasks. Our model instantiates differences in the tasks presented to young children—differences that drive comparison and decision-making processes, resulting in different patterns of noun generalization in the two tasks. Further, our model captures changes in the patterns of performance over development. Thus, the DNFT has implications at both real-time and developmental timescales.

This illustrates three unique aspects of the DNFT approach. First, the DNFT is a process-based account of behavior, learning and development. From this perspective, real-time, contextually grounded decisions constrain what is learned and what develops. Second, the DNFT represents a strong commitment to neuronal principles. This provides constraints for processes that underlie

decision-making as well as for hypotheses about developmental change. Third, the DNFT involves a commitment to an embodied view of cognition which is critical to grounding word learning in a real sensorimotor system.

Discussant: *Linda Smith, Indiana University*

Computational models both describe and predict, allowing the model to account for the underlying structures in a dataset and to show transfer (or not) to novel inputs. Each of the computational approaches summarized by the three presentations – connectionist, dynamical systems, and Bayesian – have advantages and disadvantages in meeting these descriptive and predictive goals as they are applied in different sub-domains of language and cognitive development. Among the challenges that will be highlighted are: (a) how the input is encoded, (b) the architecture used to instantiate the flow and compression of information between levels, (c) the ability of the model to adapt to changes in the distributional properties of the input, and (d) whether models that solve a particular learning problem can also be deployed to solve other problems, or must of necessity be domain- and task-specific.

Attention to Language: The Interaction between Language and Cognition

Organizer: Banchiamlack Dessalegn, Johns Hopkins University

Summary: Many in the cognitive sciences agree that there is an interaction between language and nonlinguistic cognition. The current symposium will address the consequence, mechanism and development of such interactions across development. Specifically, the papers will focus on two questions. First, how does language influence spatial cognition when language or spatial cognition is impaired? Are typical developmental patterns observed? The first two presenters will address this question by looking at spatial cognition in individuals with limited spatial language (deaf users of Nicaraguan Sign Language) and individuals with severely impaired spatial abilities but relatively spared language (people that have the developmental genetic disorder Williams syndrome). The presenters argue that knowledge of spatial terms is crucial in developing adult-like spatial representations.

Second, what is the nature of the mechanisms by which language and space interact across development? Does language simply selectively direct attention towards certain spatial representations or does language qualitatively change the nature of non-linguistic representations, and if so, how? The third presenter shows that directional spatial terms (e.g., left) help children and adults form a robust spatial representation, and proposes a specific hypothesis as the possible mechanism underlying the language effect. The final presenter shows that nonlinguistic mechanisms, e.g., attentional cues, can guide linguistic processes both in children and adults.

Overall, the symposium draws from a range of methodologies, populations and age groups to investigate the consequence, mechanism and development of interaction between language and nonlinguistic cognition -- thus yielding critical information about the structure of cognition over development.

Does spatial language guide spatial representation? Evidence from Nicaraguan Sign Language

Anna Shusterman, Wellesley College; Jennie E. Pyers, Wellesley College; Ann Senghas, Columbia University; Karen Emmorey, San Diego University; Elizabeth Spelke, Harvard University

How does limited language affect spatial representation? Past research suggests a role for language in the ability to use landmark cues in disorientations tasks, and that the acquisition of terms like left of and right of facilitates the use of landmark cues in these tasks. Does failure to acquire linguistic constructions like left of have a long-term impact on spatial representation? Furthermore, is language similarly related to other aspects of spatial cognition?

To address these questions, we examined spatial language and cognition in deaf users of Nicaraguan Sign Language. Senghas previously found that older signers, who learned early-emerging, less developed forms of the language, lacked left-right expressions, while younger signers, who learned a more developed form of NSL, linguistically marked left and right. Accordingly, older (Mage=30 years, n=7) and younger (Mage=21 years, n=8) signers were participated in tests of spatial language and non-linguistic spatial tasks including reorientation, mental rotation, map reading, and map drawing. Consistency in linguistic marking of left-right relations was correlated with superior performance on the reorientation task ($r=.67$, $p=.02$), suggesting a role for language in spatial representation even in adulthood. Older signers' performance on non-verbal tasks was above chance but worse than younger signers. This profile suggests that adults with limited spatial language achieve spatial abilities beyond those observed in young children, but that specific linguistic experience is necessary for fully developed spatial cognition. Variations in errors, reaction times, and cross-task performance shed further light on the nature of spatial representations in individuals with limited language.

A ROLE FOR LANGUAGE IN REORIENTATION? EVIDENCE FROM WILLIAMS SYNDROME

Laura Lakusta, Harvard University; Banchiamlack Dessalegn & Barbara Landau, Johns Hopkins University

One critical aspect of navigating the environment is being able to reorient oneself when disoriented. How is this task accomplished? Research has shown that species as diverse as rats, chicks, human toddlers and adults all reorient themselves by using the overall geometric structure of a layout. Surface featural cues (e.g., color) are also used, although use of these cues is more variable, depending on age, task conditions, and, most notably, language ability. The finding that language ability influences reorientation provides a case of interaction between language and non-linguistic thought. In this paper, we probe the nature of this interaction by testing reorientation in individuals with Williams syndrome - a rare developmental genetic deficit in which language is preserved but spatial representations are severely and selectively impaired.

We find that Williams syndrome individuals show a highly unusual pattern of performance in reorientation tasks, with failure to reorient using geometry alone, but success when geometry can be combined with surface featural cues. The results will be discussed in the context of current theories of modularity in reorientation, and the relevance of language in modulating spatial representations over development.

THE ASYMMETRIC RECODING HYPOTHESIS: HOW LANGUAGE MIGHT RECODE VISUAL REPRESENTATIONS

Banchiamlack Dessalegn & Barbara Landau, Johns Hopkins University

On several accounts language plays a powerful role in many cognitive processes. But what is the mechanism underlying such effects? We describe one language effect and lay out a hypothesis and some evidence to explain the underlying mechanism.

In previous work we found that providing specific directional terms to children enhanced their ability to match a visual target and avoid foils in which color and location were varied. Non-linguistic attentional manipulations did not show these effects, nor did linguistic instructions that did not include the directional terms.

We hypothesized that language provided the crucial figure-ground asymmetry as well as the specific directional information required for an accurate match. If this is true, then adults might be expected to show impairment if language is disabled by verbal shadowing.

We gave 60 adults the same task as the children in one of three conditions: No Shadow, Verbal Shadow, and Rhythm Shadow. Adults performed at ceiling in the No Shadow and Rhythm Shadow conditions, but fell to 4-yearold levels in the Verbal Shadow condition.

Thus, for both adults and children language appears to play a crucial role in carrying out this task. We lay out the Asymmetric Recoding Hypothesis which states that given an object without an inherent figure and ground, language forces the creation of an asymmetry between the parts, and thus enables the formation of a robust representation of spatial relationship. The details of the hypothesis, its predictions, and empirical test of the predictions will be discussed.

ATTENTIONAL ALIGNMENT GUIDES LANGUAGE LEARNING

Rebecca Nappa, University of North Carolina; John C. Trueswell & Lila R. Gleitman, University of Pennsylvania

Visual attention contributes to the process of event apprehension, such that the way a scene is explored influences the way it will ultimately be interpreted. Thus, the locus of speakers' attention as they interpret events guides their eventual descriptions of these events. This, in turn, causes speakers to produce cues, indicating their perspectives (such as the location of the speaker's gaze, and attention-directing gestures like pointing). Thus, the visual attention of a speaker influences both his own conceptualizations and descriptions of events and the listener/learner's conceptualizations of the same events, by way of attention-directing cues.

A set of experiments will be outlined demonstrating that this leads to significant conceptual alignment between speaker and listener, and guides the interpretation of complex events and ambiguous language (with particular emphasis on interpreting complex verbs). Specifically, when examining scenes depicting events that can be interpreted various ways, it will be demonstrated that the location of speakers' attention influences the way these scenes are ultimately described. This same effect can be seen when a speaker's attention is manipulated via gaze-direction cues (indicating that attention-directing cues from the speaker are utilized when interpreting complex events). Moreover, such attention-directing cues (gaze and pointing gestures) influence the way complex utterances (containing unfamiliar nonce verbs) will be interpreted by both adults and children in such a visual context. Through this attentional alignment, speakers and listener/learners arrive at aligned conceptual and linguistic representations of events.

DISCUSSANT: *Dedre Gentner, Northwestern University*

Friday, October 26, 2007: 4:00 - 5:45 pm

Interactions between Social Cognition and Object cognition

Co-Organizers: Kristin Shutts & Katherine Kinzler, Harvard University

Summary: The goal of this symposium is to ask how children integrate their perceptions of the social world with their evaluations of the physical world. For example, how do properties and past behaviors of other individuals influence children's own preferences for different kinds of objects? To whom do children look when seeking information about unfamiliar objects, and when reasoning about physical events?

The first two papers in the symposium (presented by K. Kinzler and K. Shutts) provide evidence that infants and children attend to social category information (e.g., about spoken language, gender, and age) when reasoning about their own preferences for foods and artifacts. The third paper (presented by C. Fawcett) presents data showing that when children are given the opportunity to choose among objects hidden from view, they trust opinions of individuals who have shown concordant object preferences in the past. The fourth paper (presented by V. Jaswal) shows that young children are able to use testimony from adults in order to overcome errors in reasoning about physical events involving objects. Together the findings suggest that infants and children are able to use knowledge in one domain (e.g., the social realm) in order to solve problems in other domains (e.g., object preferences and object mechanics).

Infants' selective preference for "native objects"

Katherine D. Kinzler (presenter), Emmanuel Dupoux, & Elizabeth S. Spelke, Harvard University

From birth, humans display a remarkable sensitivity to language and linguistic differences. Neonates prefer their native language to a foreign language, and even discriminate two foreign languages provided that they have sufficiently different rhythmic properties.

The present paper questions whether 1) infants demonstrate a social preference for a speaker of a native language over a speaker of a foreign language, and 2) whether this early social preference influences infants' early understanding of and preference for objects. In Experiment 1, 5-6 month-old infants demonstrated a visual preference for people who previously spoke in their native language with a native accent. In Experiments 2 and 3, 10-month-old infants preferred to accept one of two identical toys when offered, and one of two different toys when modeled, by a speaker of a native language rather than a speaker of a foreign language. These effects obtained even though language was never directly paired with the objects. Experiment 4 provides evidence that 12-month-old infants preferentially choose foods that are first eaten by a native speaker rather than a foreign speaker.

Together, these findings suggest that infants attend to social information to inform their early preferences among objects, including preferences for some objects over others, differential willingness to accept one of two identical objects when offered by individuals of different social categories, and even preferences among foods that they have previously tasted and enjoyed.

Social categories guide young children's preferences for novel objects

Kristin Shutts (presenter), Mahzarin R. Banaji, & Elizabeth S. Spelke, Harvard University

Humans as a species are extraordinarily gifted at learning information from other humans in their social group. From language to dance to dress, humans come to act like those around them. This "cultural learning" begins at an early age; even infants look where others, and do what others do (e.g., Meltzoff & Moore, 1977; Scaife & Bruner, 1975; Tomasello, Kruger, & Ratner, 1993).

In the present work, we ask whether children are selective in whom they learn from, by investigating the influence of social categories on young children's preferences for novel objects. In two experiments, three-year-old children were introduced to pairs of unfamiliar individuals, each of whom stated a preference for a different novel object. Members of pairs differed according to gender (male, female), race (White, Black), and age (child, adult). In Experiment 1, children demonstrated robust preferences for objects endorsed by same-gender individuals, but did not use race information as reliably as a basis for inferring their own preferences. In Experiment 2, children again selected objects favored by same-gender individuals, and also demonstrated a preference for items endorsed by same-age peers over adults.

These data provide a window into the social categories that children deem to be meaningful, and their influence on the development of the child's own object preferences and choices.

Young children understand the subjective nature of preferences

Christine Fawcett (presenter) & Lori Markson, University of California, Berkeley

How do we decide whose recommendation to trust? Trusting others with preferences similar to our own is often a good heuristic, but equally important is knowing how to extend that trust. To address this question, we have been exploring how children's sensitivity to shared preferences influences their determination of who is a reliable source of information about objects.

In a series of experiments, two-year-old children learned two actors' contrasting preferences for various items in a particular category (e.g., foods). One actor shared the child's preference and the other did not. Children were then tested on their use of preference information when making inferences about the two actors' preferences for new items in categories that varied in relevance to the original category. Children were more likely to select an unseen item described by one of the actors as "her favorite" if that person had previously demonstrated a shared preference with the child for other items in the same category. Interestingly, children were more likely to extend their trust in a person's preferences across related categories (e.g., toys and books) compared to unrelated categories (e.g., television programs and foods).

The findings demonstrate that two-year-old children view a person who shares their preference as a reliable source of subjective information, at least within a designated category. This work further informs our knowledge of how children's understanding of the social world influences their reasoning about the physical world.

Trust in testimony about the physical world

Vikram K. Jaswal, University of Virginia

The physical world seems largely knowable from personal experience. In two studies, we investigated toddlers' willingness to revise a belief about the physical world—in particular, about the trajectory of a falling object—on the basis of what an adult tells them.

In Study 1, 30-month-olds saw an apparatus consisting of three chimneys affixed atop three cups. Opaque, curved tubes connected each chimney to a non-adjacent cup below. The experimenter dropped a ball through one of the chimneys and invited children to search for it. Children had a robust "gravity bias," incorrectly searching the cup directly beneath the chimney where the ball had been dropped 76% of the time (see also Hood, 1995). However, if the experimenter mentioned the actual cup where the ball landed before inviting children to search, they made the gravity error just 25% of the time (and searched correctly 67% of the time).

In Study 2, we explored the limits of toddlers' deference by using clear rather than opaque tubes. Children made the gravity error just 11% of the time (and searched correctly 84% of the time). However, if the experimenter mentioned the gravity cup before allowing children to search, they made the gravity error 52% of the time (and searched correctly just 41% of the time).

In short, children expect that adults will provide them with veridical information: They frequently weighted an adult's testimony more heavily than expectations based on naïve physics, or even than what they had just seen with their own eyes.

Symposium Discussant: *Susan Carey, Harvard University*

Rational Statistical Inference in Cognitive and Language Development

Organizer: Fei Xu, University of British Columbia

Summary: Researchers in cognitive development tend to be either nativists or empiricists. Nativists emphasize innate concepts and knowledge whereas empiricists emphasize learning mechanisms. This symposium presents a new approach to the study of cognitive and language development, integrating domain-specific prior knowledge and rational statistical inference mechanisms within a Bayesian framework. The four participants will present a set of papers illustrating how this approach has generated both new empirical findings and new computational models. Two of the participants, Xu and Denison, will present empirical studies on word learning, property induction, and infant statistical inference. The other two participants, Kemp and Griffiths, will present models of causal learning, word segmentation, and how learners acquire abstract causal schemata and semantic knowledge. We aim to go beyond the nature-nurture dichotomy by presenting a concrete proposal on how to integrate statistical information in the input with prior knowledge.

Rational statistical inference in word learning and property induction

Fei Xu, University of British Columbia

Research in language and cognitive development has discovered both powerful learning mechanisms and early concepts and knowledge in infants and young children. However, it remains unclear how statistical learning mechanisms interact with conceptual biases. I present two case studies illustrating how a Bayesian framework provides us with the tools for integrating

statistical information with prior knowledge. In the first set of experiments, we show how children and adults integrate their prior knowledge about words (e.g., count nouns tend to refer to kinds of objects) with input statistics (e.g., the number of exemplars and the perceptual span of the exemplars) in learning words at multiple hierarchical levels (subordinate-level, basic-level, and superordinate-level). In the second set of experiments, we show how children and adults' generalization of novel properties are modulated by a prior biase (i.e., some properties are generalizable but some are not) using the same statistical information as in the word learning studies. Together we provide evidence that the same statistical inference mechanism is employed in multiple domains but its application is modulated by prior biases.

Statistical inference in human infants

Stephanie Denison and Fei Xu, University of British Columbia

Two sets of experiments investigated whether basic statistical inference mechanisms are available in infancy so they may potentially guide learning later on, using a violation-of-expectation looking-time procedure. In the first set of experiments, we asked 8-month-old infants to generalize from a small sample to a larger population using basic principles of probability. For example, infants were presented with either 4 red and 1 white Pingpong balls or 1 red and 4 white Pingpong balls being pulled out of a box, and they were then shown a box filled with many red Pingpong balls and a few white ones. If infants can use basic principles of probability in this task, they would find the 1 red and 4 white Pingpong ball sample unexpected. Results showed that infants looked longer at the unexpected outcome. In a second set of experiments, we asked if 11-month-old infants were sensitive to whether the sample was a random sample from the box or not. Results showed that given random sampling, infants showed the same pattern of looking as the 8-month-old infants in the first set of experiments. But in the non-random sampling condition where the experimenter expressed a preference for a certain color balls then looked into the box while pulling out the sample, the looking time pattern was predicted by the experimenter's expressed preference and not by the proportions of red vs. white balls in the box. These studies suggest that basic statistical inference mechanisms may be available early in infancy.

Bayesian models as a tool for revealing inductive biases

Tom Griffiths, University of California at Berkeley

Many of the central problems in cognitive development - from making inferences about causal relationships to learning language - are inductive problems, requiring children to generalize beyond the observed data. Research in mathematical statistics indicates that one of the most important factors involved in successfully solving inductive problems is having appropriate inductive biases, limiting the set of possible solutions to those problems. Understanding how children make generalizations thus requires understanding their inductive biases. I will argue that computational models based on the principles of Bayesian statistics provide a tool for revealing the inductive biases of human learners. I will demonstrate the value of this approach through two case studies: analyzing the knowledge about causal systems that guides learning about blicket detectors, and examining how different assumptions about the nature of words determine the output of statistical models for extracting a lexicon from unsegmented speech. These case studies show how Bayesian models can be used to reveal the inductive biases that allow children to learn so much about the world from small amounts of data.

The acquisition of inductive constraints

Charles Kemp, Massachusetts Institute of Technology

Inductive learning relies critically on constraints, and psychologists have described many constraints that appear to guide children's learning. Most of these constraints are usually assumed to be innate, but hierarchical Bayesian models help to explain how some of these constraints can be learned. Hierarchical Bayesian models include representations at many levels of abstraction, and the representations at the upper levels can be viewed as constraints on the representations at the lower levels. The probabilistic nature of these models allows them to make inferences at many levels of abstraction. In particular, these models demonstrate how knowledge can be acquired at levels quite remote from the data of experience---levels where the learning problem amounts to the problem of learning inductive constraints.

The hierarchical Bayesian approach has been applied to problems from several different domains, including word learning, grammar learning, causal learning, and the acquisition of semantic knowledge. I will describe a model that learns causal schemata---systems of abstract causal knowledge that constrain inferences about sparsely observed causal relationships. I will also describe a model that discovers structural constraints on semantic representations. One such constraint is the M-constraint, which states that ontological knowledge is better described by a tree structure than a set of arbitrarily overlapping clusters.

The Function of Action in Perceptual and Cognitive Development

Co-Organizers: Jessica Cicchino and David Rakison, Carnegie Mellon University

Summary: Children are not passive observers of the world around them; rather, what they encounter and encode is dictated largely by the actions they produce. In recent years a substantial number of research programs have begun to recognize the role that experiences producing and observing action play in how infants and children interpret their surroundings. The goal of this symposium is to bring together the latest research regarding how these early action experiences shape the development of cognition in a variety of domains. To this end, the first two papers discuss the influence of infants' exploratory behaviors on their perception and integration of object features. The next paper explores how children equate their own actions with the actions performed by others and investigates how these experiences influence how children imitate. Finally, the last two papers consider links between infants' ability to produce actions and identify these same actions or motion types when performed by other people or entities.

Bringing together findings from a variety of areas within early cognition in which action experience bears on development will allow for consideration of multiple mechanisms by which early action and cognition are connected. Additionally, the research presented here will shed light upon the nature of action representations early in life and the origins of knowledge regarding objects, motion, and people. Thus, this symposium will result in a better understanding of how and why action experience influences cognitive and perceptual development.

The Relation Between Motor Development and Infants' Representation of the Surface Features of Objects

Lisa M. Oakes, University of California, Davis, and Sammy Perone, University of Iowa

Consider the following event: a hand reaches toward a round purple object, squeezes it, and then the object squeaks. What do infants learn about this event? There are several reasons why the surface features of the objects might be less salient than the action and sounds in these events; one possibility is that object appearance is intimately tied to the actions performed on the objects. Actions and object features are represented together in the human adult brain. We will present data revealing a developmental trajectory from 7-month-old infants representing only the sound and the action to 10-month-old infants representing the appearance as well as the sound and the action. At 10 months, infants link the actions to object appearances in this type of event—learning, for example, that purple objects are rolled and yellow objects are squeezed. Infants' sensitivity to object appearance may therefore be related to their developing motor skills. Indeed, we observed that between 6 and 7 months attention to the surface features of the objects was significantly related to infants' motor skills. When assessed in an object-exploration task, infants who were more effective at picking up objects, and who successfully picked up a wider variety of objects, represented object appearance in the multi-modal, dynamic events just described. Infants who were less motorically skilled failed to represent appearance. The possible bases of this relation, and potential mechanisms of development, will be discussed.

Object Exploration and Detection of Attribute Change in Infancy

Amy Needham and Klaus Libertus, Duke University

Object exploration is action in the service of learning about the attributes of an object: mouthing an object allows you to determine its texture; looking at an object allows you to determine its color (Gibson 1988). Infants' exploration of objects undergoes important changes over the first several months of life. For instance, Rochat (1989) showed striking changes in infants' exploratory behaviors over the first five months of life: two- and three-month-old infants tend to show relatively more oral exploration; four- and five-month-old infants show relatively more visual exploration. These changes should have consequences regarding which object attributes are detectable or salient to infants while they explore them, which should in turn have functional consequences for the attributes of objects that infants respond to. This possibility was investigated in the current research.

Using a method devised by Ruff (1984), 4-, 5-, and 7-month-old infants' detection of a change in either texture or color was assessed. A textured teether or colored spoon was presented to the infant on three consecutive trials, and on the fourth trial an object that was the same except for one attribute (the teether's texture; the spoon's color) was presented instead. Infants' visual and manual exploration time was measured and the percent change in the amount of exploration is shown above. Our results show that the younger infants, whose exploration is primarily oral in nature, showed a large increase to the change in texture. In contrast, the older infants, whose exploration is primarily visual in nature, showed a large increase to the change in color. Additional evidence of a control condition involving no change between trials three and four will also be presented.

These findings support the conclusion that infants' tendency to engage in oral or visual exploration of objects influences the information they obtain. In this sense, we can think of infants' visual and oral exploration as reflecting the aspects of the objects to which they have attended. Further, these results indicate that infants' decisions about whether to explore an object by mouth or by eye determines much about how they will perceive that object. Implications for perceptual-motor relations will be discussed.

Picky Imitators: 'Prior Experiences' of Self and Other Influence Children's Imitation

Rebecca Williamson and Andrew Meltzoff, University of Washington

Our recent research shows that preschoolers' imitation varies as a function of their own prior action experience. We showed that if children have had a difficult time with a task, they are more likely to adopt the distinctive action they observe another use. Here we investigate whether 3-year-olds also use another person's difficult prior experience as a guide to imitation. Can the prior difficulties of others substitute for the prior difficulties of the self in rendering children more open to learning and imitating novel acts they see?

The children (N=16) saw two experimenters each take a turn at completing a straightforward task (e.g. opening a drawer to get a toy). E1 either had an easy or a difficult experience with the task. E2 then modeled using a distinctive means (such as flipping a switch) to complete the task easily. When E1 had a difficult time with the task using ordinary means, children were more likely to imitate E2's novel action (M = 75%) than when E1 succeeded using ordinary means (44%). These preliminary results suggest that action imitation is not a blind process but is influenced by the prior experiences of both self and other. If children have a self-experience or observe from others that ordinary means are not efficacious, they are significantly more likely to adopt the novel means they observe. Human children are not blind imitators of action; prior experience influences what and when they imitate.

Producing and Processing Self-Propelled Motion in Infancy

Jessica Cicchino and David Rakison, Carnegie Mellon University

Self-propelled motion, or movement that begins without apparent external force, is a nearly irrefutable cue to animacy; by and large only people and animals, but not inanimate objects, are self-propelled. Because of the essential role that self-propelled motion plays in the development of early concepts of animates, there has been interest among researchers regarding the origins of the ability to recognize self-propulsion. In this talk we will explore the possibility that experience producing self-propelled motion by crawling influences infants' ability to process the self-propelled motion of other objects.

To investigate this issue, 5-, 6-, 7-, and 8-month-old infants were tested in a paradigm similar to that used by Markson and Spelke (2006) in which their preferential looking to self-propelled and caused-to-move objects was measured. Our results revealed that 5- and 6-month-olds attended to objects that engaged in a different type of motion than did 8-month-olds; crucially, the looking patterns of 7-month-olds with crawling experience paralleled that of older infants, and the looking patterns of non-crawling 7-month-olds mirrored that of younger infants. These findings indicate that infants' processing of self-propelled motion changes between 6 and 8 months of age and that the onset of self-locomotion is a factor that underlies this developmental progression. Furthermore, this discovery suggests that the close coupling between infants' action production and action perception may be more abstract than previously realized, as action experience in the current study facilitated perception of the movement of animated geometric shapes rather than the action of another person.

Acting and Understanding Action: Potential Developmental Relations

Amanda Woodward, Sarah Gerson, and Neha Mahajan, University of Maryland, College Park

Fundamental to human experience is the fact that we live in a world of perceived intentional agents. To adult eyes, the actions of others are not simply motions through space, but instead structured by goals, intentions, and perceptions. In the past decade, research has revealed that this aspect of social perception can be traced to early in the first year of life. Infants selectively attend to the goals of actions, responding more strongly to changes in actions goals than to changes in motion.

The existence of this ability early life raises the question of how it originates. Here, I consider the possibility that infants' own emerging ability to coordinate their actions in service of goals provides representational structure for the perception of others' goal-directed actions. Three kinds of evidence support this possibility. (1) There are correlations between infants' own abilities to produce goal-directed actions and their perception of others' actions as goal-directed; (2) Interventions that enable new modes of goal-directed action in infants also affect perception of those same actions in others; (3) Infants' analysis of others' actions as goal-directed is evident not only in their looking times, but also in their own overt actions. Taken findings indicate that infants' action analysis is rooted, at least in part, in their own experience as agents. The dramatic changes that occur in infants' motor competence during the first year are linked to developments in action perception.

saturday, October 27, 2007: 8:45 am– 9:45 Am

Plenary Talk: Learning to Perceive to Learn

Rob Goldstone, Indiana University

Our concepts are at least partially based on the outputs of perceptual processing, but concept learning also has a reciprocal influence on the development of perceptual features. Rather than viewing the "vocabulary" of perceptual primitives as being fixed, this view maintains that the vocabulary is dependent on categorization demands. Two apparently opposed mechanisms of conceptually induced perceptual learning are unitization and differentiation. Unitization creates a single perceptual chunk for a complex assembly of stimulus components, whereas differentiation isolates originally fused perceptual dimensions. These mechanisms are reconciled in a neural network model that incrementally creates perceptual detectors based on categorical (supervised) and statistical (unsupervised) information. Empirical results from perceptual learning experiments in infants and adults are interpreted in light of this model. The implication of the model and surveyed experiments is that we create perceptual detectors from our experience with the world, and then use combinations of these detectors to shape our experience of this same world.

saturday, October 27, 2007: 10:15 am– 12:30 pm

Presidential Symposium: Children's Learning

Organizer: Henry Wellman, University of Michigan

Summary: Children's learning is a classic topic for scholars of cognitive development (see e.g., Stevenson's 1973 book *Children's Learning*). In the last 15 years it has re-emerged as an exciting contemporary topic as well. Infants, children, as well as young and old adults all learn on their own, from others, and in the classroom. Cognitive structures impact learning, learning impacts cognitive structures, and for some topics, perhaps, the story of cognitive development becomes the story of accumulated learnings. The presenters in this symposium include leading voices in the field who will present theory and data about crucial issues and topics for understanding children's learning.

There's Nothing As Practical As a Good Theory

Robert S. Siegler, Carnegie Mellon University

Theoretical analyses of the development of numerical representations suggest that playing linear number board games, akin to Chutes and Ladders, should enhance young children's numerical knowledge. Consistent with this prediction, playing such a game for roughly one hour increases low-income, urban preschoolers' proficiency on a diverse set of numerical tasks: numerical magnitude comparison, number line estimation, counting, and numeral identification. The gains remain present nine weeks later and are equally strong for African-American and Caucasian children. Playing an identical game, except for the squares varying in color rather than number (akin to Candy Land), does not improve performance on any measure. Moreover, preschoolers' amount of home experience playing number board games is positively correlated with their numerical knowledge, whereas their experience playing card games and video games is not. Thus, playing numerical board games with children from low-income backgrounds appears to increase their numerical knowledge and helps them start school on a more equal footing with classmate from more affluent backgrounds. The more general theoretical and practical gains that can be realized through integrating information processing and socio-cultural approaches to cognitive development and learning will also be discussed.

Learning by expecting: The role of statistical learning in infant language processing

Jenny Saffran, University of Wisconsin

One way that learners discover structure in complex environments is to track statistical regularities in the input. How is this information actually used, in particular how is it used for language learning given the demands of language processing? This talk will explore the hypothesis that like adults, children, and some classes of computational models, infants exploit such regularities by making predictions about what will occur downstream while listening to language input. These predictions facilitate rapid processing, may spur subsequent learning, and suggest continuity between the mechanisms used for language learning and the mechanisms used for language processing.

Twisting the Lion's Tail: Exploratory play and children's causal learning

Laura Schulz, MIT

Despite almost universal agreement that children learn causal relationships through exploratory play, little is known about how children's play might support accurate causal learning. Children are poor at designing informative experiments and there has been little evidence for any systematic patterns in exploratory behavior. Here I suggest that, although the particular actions children take in exploratory play are quite noisy, children's spontaneous exploration is nonetheless consistent with rational principles of inductive inference. I will discuss several studies suggesting that there is a systematic relationship between children's prior knowledge, the evidence they observe, and their spontaneous exploratory behavior. In particular, I will suggest that children tend to engage in more exploratory play when the interpretation of evidence is ambiguous. Thus even though children's particular exploratory actions are unsystematic, they often spontaneously generate evidence that could support accurate causal learning.

Learning, Development, Primary Processes, and Secondary Processes: Discussion

David Klahr, Carnegie Mellon University

A symposium entitled "Children's Learning" must confront the venerable and vexing issues surrounding the difference between learning and development, and between what David Geary has provocatively defined as "primary" vs. "secondary" processes. Are the early forms of statistical learning described by Saffran, or the impressive achievements in causal reasoning described by Schulz, examples of primary or secondary processes? Are they instances of development or of learning? Are the processes that enable children in Siegler's studies to make substantial advances in their numerical knowledge after a brief period of play with a carefully crafted board game based on primary or secondary processes? A second, but perhaps related puzzle in all of this is why the early acquisitions are poor predictors of later learning in more conventional instructional contexts. For example, my own research raises the question of why the early acquisition of causal understanding reported by Schulz and colleagues doesn't seem to manifest itself when children first begin to attempt to create simple, unconfounded experiments in science classes.

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saturday, October 27, 2007: 2:00 – 3:45 pm

Cognitive Developmental Perspectives on Social Categorization and the Implications for Intergroup Bias

Organizer: Andrew Baron, Harvard University

Summary: Cognitive developmental approaches to social categorization have traditionally emphasized Piagetian assumptions of stage-like development, domain-general categorization, and egocentrism. In this symposium, we go beyond these early formulations by specifying crucial roles for linguistic labeling and domain-specific aspects of categorization, with an aim towards revising theoretical models of social categorization and demonstrating the implications of these models for intergroup bias.
Bigler and Dunham will offer complementary perspectives on the psychological consequences of categorizing others as belonging to outgroups. Each will focus on the ways in which categorization divides social space into ingroups and outgroups revealing developmental changes in the ability to integrate information about self and other (Bigler) and developmental stability in rapidly-emerging mechanisms of ingroup-favoritism (Dunham). Heyman will expand the focus by exploring the broader implications of labeling on stereotyping in the social domain. Finally, Baron will help to flesh out the unique features of this domain by focusing on the necessary and sufficient conditions for the acquisition of inductively rich social categories. As a pioneer in bringing cognitive developmental methods and theories to bear on issues of social categorization and inductive reasoning, Gelman is uniquely situated to integrate the conceptual issues raised by these new findings and will serve as a discussant on this symposium.
The established and emerging researchers in this symposium are accumulating new evidence which challenges existing theory and pushes us towards a new understanding of social categorization and its implications for intergroup bias.

Cognitive-Developmental Perspectives on the Coordination of Knowledge about the Self and Social Groups

Rebecca S. Bigler, University of Texas at Austin, and Meagan M. Patterson,University of Kansas

Categorization appears to play a central role in the process of social stereotyping and prejudice. As many theorists have noted, the development of social stereotypes may reduce the cognitive load inherent in processing category members as individuals. Individual humans are, however, themselves members of particular social categories. Social categories are unique, therefore, in that the cognitive representation of some (but not other) groups is inclusive of the self. How do children integrate their knowledge and beliefs about the self with those concerning social categories? What cognitive limitations might constrain the process? In a series of studies, we have used field experiments in which children are assigned to novel social groups to address questions

concerning the etiology of ingroup identification and intergroup attitudes. In these studies, children from a variety of ages are randomly assigned to novel social groups (e.g., "red" or "blue" groups) in their classrooms. The characteristics of these groups and, in some recent work, characteristics associated with the self are manipulated. After several weeks, children's views of themselves and others (i.e., trait evaluations, peer preferences, helping behavior, etc.) are assessed. In the proposed talk, we will summarize the findings from these studies and argue that children's ability to integrate information about the self and others changes across ages, and has important implications for social stereotyping and self views.

The Power of Membership: Minimal Group Biases in Childhood

Yarrow Dunham, University of California, Merced

Like categories of every stripe, social categories provide a means of placing an entity among relevantly similar others in support of inductive inference. However, social categories are a special case, as the entities involved often include the self, making social categorization particularly relevant for ongoing processes of self-definition and identity development. At the most basic level, this is as simple as establishing an ingroup/outgroup dichotomy based on a given property. Generally, the social categories we care about are based on properties we care about, such as biological distinctions (gender), ideological commitments (protestant, democrat), and facts about our history (nationality). The significance of social categories is commonly thought to be derived from the importance of these defining properties; however, this view is challenged by Tajfel's minimal group work demonstrating that even social groups based on trivial properties rapidly cause intergroup polarization. I present research from two lines of inquiry providing strong evidence for early-emerging minimal group effects in children. With respect to both familiar and novel social groups, children manifest ingroup preference as soon as or soon after they acquire the ability to categorize along a given dimension. What's more, ingroup preference appears across a wide range of measures, including traditional self-report preferences, implicit attitudes, resource allocations, behavioral expectancies, and systematic memory biases. Taken together these effects constitute an elaborate set of ingroup-favoring learning biases which could powerfully constrain further learning about groups, potentially supporting the rapid emergence and entrenchment of real-world bias.

Noun Labels and Social Reasoning

Gail Heyman and Cristine Legare, University of California, San Diego

Nouns typically identify context-independent kinds (Gelman, 2003) that point to deeper commonalities (Waxman, 1999). Previous research suggests that when noun labels are applied to people (e.g., 'carrot-eater') they imply stability (Gelman & Heyman, 1999). We will present recent research that builds upon this finding.

In a study of 80 8- to 12-year-olds examining the practical implications of labeling, we described characters' performance either with or without the use of nominalized descriptors such as 'math whiz.' Children in the labeling condition were more likely to attribute the characters' skill to innate ability and to predict that it would persist even in the absence of further practice, which corresponds to a conception of ability that has negative implications for achievement motivation (see Dweck, 1999).

In other research we are examining beliefs about when it is appropriate to describe people in terms of compound nouns (e.g. refer to a girl who spends time using telescopes as a 'telescope girl'). Results indicate that adults are more likely to view compound labels as appropriate when the associated activity is unique within the peer group, frequent, or enjoyable on the part of the individual being described. We are also finding that children as young as age 4 are more likely to view the use of compound labels as appropriate when the individual enjoys the activity, even after controlling for frequency. Taken together, these results suggest that the use of noun labels promotes a broad range of psychological inferences and helps to define human kinds.

Foundations of Social Categorization

Andrew Scott Baron, Harvard University

Recent research in cognitive development has revealed domain-specific constraints on the properties that are privileged during the categorization of living things (e.g., biological origins) and artifacts (e.g., intended function; Keil, 1989). Given the important developmental challenge of identifying social categories and the properties they project (e.g., behaviors, traits, preferences), it is surprising that few studies have explored constraints on social categorization (but see Deisendruck & laHavie, 2006). The present research seeks to understand how children acquire representations of social groups by asking whether there are limits on the properties that can define inductively rich social groups.

Across five experiments, participants (3-5-year-olds, 6-8-year-olds, adults) were introduced to two novel social groups in a picture book. Participants observed two individuals from one group behave in an anti-social manner, and were then asked to make inferences about new behaviors performed by new members of each group. We examined whether participants' inductive inferences were constrained by the property defining the group (e.g., biological properties such as skin color, non-biological properties such as hat color, the use of noun labels vs. proper names, and whether participants were asked to identify with one group over the other). We also explored whether these potential constraints undergo changes across development. Results

provide evidence for distinct necessary and sufficient conditions for social categorization while also revealing the rapid acquisition of social category concepts at all ages tested. These data also provide important insights into the relationship between categorization processes specific to social groups and the development of stereotypes.

Discussant: *Susan Gelman, University Of Michigan, Ann Arbor*

The Role of Comparison in the Development of Relational Representations and Structured Thought

Organizer: Leonidas Doumas, Indiana University

Summary: The ability to comprehend and reason about relations (i.e., relational thinking) is central in human cognition. Relational thinking includes reasoning about higher order relations (e.g. causal, similarity, contrasting) or specific relations (e.g. bigger, above, chasing). Relational thinking is powerful because it is structured, which allows the generation of inferences and generalizations that are constrained by the roles that elements play, rather than strictly the properties of the elements themselves.

The role of relational comparisons in learning is emerging as an important area of developmental research. Relational comparisons allow learners to derive symbolic, abstract, and conceptual knowledge representations that are generative, in that children can then use them broadly in new contexts to reason about new elements. Thus relational comparisons can operate as agents of development. Acquired knowledge representations then also act as a second mechanism of development, since with greater knowledge, children can perform more sophisticated relational reasoning.

This symposium brings together researchers examining the productive interplay between learning and relational reasoning. Gentner, Christie, and Namy explore the benefits of various different organizations of relational comparisons, including the role of linguistic labels. Opfer, Furlong, and Bulloch describe the effects of relational comparisons on future generalizations. Doumas describes a computational theory of how comparison fascilitates the learning of novel relational concepts. Ankowski and Sandhofer examine the efficacy of comparison in various learning situations. Rittle-Johnson and Star examine relational comparisons in learning for mathematical concepts. Finally, Richland considers the interplay between acquisition of knowledge representations and children's developing processing capacities.

Comparison in relational learning

Dedre Gentner, Northwestern University; Stella Christie, Northwestern University; Laura Namy, Emory University

Comparison processing has been implicated in the development of relational thought. Our research investigates the generality of comparison as a learning mechanism and the specific processes by which comparison fosters learning. These include learning by abstracting common relational structure from a comparison and learning via progressive alignment - from close literally similar pairs to more distant abstract analogs. We have also found that common linguistic labels can foster relational comparison, thereby promoting relational insight. In Study 1, 3-year-olds watched as we labeled a novel spatial relation, either exemplified with a single standard or with two standards side-by-side. Children who compared two standards were more likely to extend the label to another item with the same spatial configuration than were those who saw only one standard, suggesting that comparison promoted attention to the common relation.

Study 2 showed that 4- and 6-year-olds who received relational labels were better at learning a relational concept than those who simply saw the same two analogous exemplars without labels. However, 3-year-olds were unsuccessful in both conditions. In Study 3, we gave 3-year-olds the same relational concepts using a progressive alignment from close pairs to the same far analogs that were used in Study 2. The 3-year-olds who received a combination of progressive alignment and relational labels during training were able to successfully learn the relation. In sum, we find that comparison can reveal common relations; that common labels promote this process of comparing and abstracting; and that for early learners, progressive alignment can accelerate relational learning.

What makes relational reasoning so smart?

John E. Opfer, Ellen E. Furlong, and Megan J. Bulloch, Ohio State University

Representations of relations are often celebrated for their positive effects on generalization (e.g., ignoring superficial similarities), but relational representations may also have negative effects. To examine this, we investigated development of relational reasoning on two relational-match-to-sample tasks in domains of biology (Study 1) and number (Study 2).

In Study 1, participants (3-, 4-, 5-year-olds, and adults) generalized novel information on two types of problems—offspring problems, where relational matches yielded accurate generalizations, and prey problems, where perceptual matches yielded accurate generalizations. On offspring problems, we replicated prior findings of increasing relational matches with age. However, we observed decreasing relational matches on prey problems. These findings suggest that the relational shift commonly observed

in analogical reasoning may reflect a general increase in children's sensitivity to reliably accurate information rather than an overall preference for generalizing over perceptual similarity.

To examine this issue further, Study 2 tested how well children ignored perceptual similarity when asked to generalize the hidden location of an object, where relational matches yielded accurate generalizations. We again found relational information allowed preschoolers to ignore perceptual similarities. Representations of spatial-numeric relations, however, had a cost for the youngest children in particular: spatial-numeric associations appeared to be so automatic that learning was impeded when numerical relations failed to fit children's prior representations.

Taken together, results from Studies 1 and 2 suggest that what develops in relational reasoning is not a freedom from the bonds of perceptual similarity but an increase in the sensitivity to which relational similarities are—and are not—reliable.

A COMPUTATIONAL MODEL OF THE DEVELOPMENT OF STRUCTURED RELATIONAL REPRESENTATIONS

Leonidas A. A. Doumas, Indiana University

Traditional connectionist models based on distributed representations provide a good account of younger children's reasoning based on whole-object similarity, but do not account well for later relational thought. Alternately, systems based on structured relational representations provide a good account of older children and adult's relational thought, but provide no account of where the relational representations come from in the first place. However, while we can account for the behavior of both younger and older children, we cannot account for how the ability to reason relationally develops.

DORA (Discovery Of Relations by Analogy) is a symbolic connectionist network that uses time as a signal to dynamically bind distributed (i.e., connectionist) representations of relational roles and objects into explicitly relational (i.e., symbolic) structures. DORA relies on the processes of comparison, analogical mapping and intersection discovery to highlight shared abstract properties between separate systems and subsequently predicates these similarities as explicit (i.e., symbolic) properties of the systems. These processes permit the discovery and predication of shared properties and relations across otherwise different systems and thus bootstrap the discovery of relational structure from unstructured examples. We propose that DORA's learning mechanism provides an account of both analogical development as well as the transition from similarity to category-based induction.

THE EFFECT OF STIMULI FEATURES ON CHILDREN'S ABILITY TO USE COMPARISON AND CONTRAST FOR CATEGORY ACQUISITION

Amber N. Ankowski and Catherine M. Sandhofer, University of California, Los Angeles

A large body of research has demonstrated that viewing multiple examples leads to better performance on a variety of tasks acrosss a variety of measures. However the specific situations in which comparing or contrasting multiple exemplars is effective for category acquisition has not been investigated. Comparison entails simultaneously viewing two or more examples that are similar in some relevant dimension (e.g. comparing two red things), while contrasting involves viewing two or more examples that differ in a relevant dimension (e.g. contrasting a red thing with a blue thing). The current studies examined whether children's ability to learn through comparison or contrast is affected by the concept children are learning and the specific examples they are viewing. The studies presented in this talk systematically examine the efficacy of comparison and contrast 1) in learning categories versus relations and 2) when the stimuli do and do not vary in ways that are irrelevant to the concept to be learned. As a whole the studies reveal that the specific features of stimuli presented affect children's ability to use comparison and contrast for category acquisition. Importantly, the results of these studies show that contrast in at least one dimension is essential for children to learn a new category. The current studies also suggest an explanation for discrepancies in previous research regarding the relative effectiveness of comparison and contrast for category acquisition. The results suggest that comparison and contrast are not always powerful tools for learning, but instead their effectiveness is situational.

WHEN IT PAYS TO COMPARE: BENEFITS OF COMPARISON IN MATHEMATICS CLASSROOMS

Bethany Rittle-Johnson, Vanderbilt University; Jon R. Star, Michigan State University

Comparison is emerging as a fundamental learning mechanism and an important teaching approach. We have identified and combined key findings on comparison from research in cognitive science and mathematics education that might facilitate three key learning outcomes in mathematics - procedural transfer, procedural flexibility and conceptual knowledge. One series of experiments focuses on seventh- and eighth-grade students learning to solve equations (e.g. $2(x - 3) = 8$). A second experiment focused on fifth-grade students learning about computational estimation (e.g. About how much is $27 * 48$?). Having students compare multiple solutions to the same problem, rather than studying the same solutions one at a time, led to greater procedural transfer and flexibility (and comparable conceptual knowledge) across the experiments. A recent experiment is exploring how different types of comparison impact learning, such as comparing isomorphic problems with the same solution method vs.

different solution methods to the same problem (as in our original studies). Preliminary findings suggest that condition interacts with prior knowledge. Although there is general agreement that comparison facilitates learning, attention to what is being compared and by whom is critical to understanding comparison and to facilitating mathematics learning.

Learning and Processing in Children's Development of Analogical Reasoning

Lindsey E. Richland, University of California, Irvine

Children's comparative reasoning skills improve with age. I will describe a series of studies that use picture analogy tasks with children ages 3 to 11 to explore the mechanisms behind this development. Existing findings show that children's comparative reasoning improves in two ways: ability to identify and compare increasingly multi-part, complex relations, and the ability to reason relationally in spite of salient, irrelevant distraction. The series of studies I'll describe investigated the relationships among children's knowledge acquisition, developing working memory, and developing attentional control on these known patterns of comparative reasoning development.

Overall, two studies of U.S. children and two cross-cultural studies suggest that in spite of theoretical arguments that propose one or the other, all three factors are crucial. Further, the relationship between these factors follows predictable patterns. We find that the ability to handle complex relations relies upon developing working memory capacity but is moderated by knowledge acquisition, while maturational processes for controlling attention seem to constrain comparative reasoning over and above the effects of learning.

To Model or Not To Model—Is That a Central Question?

Organizer: Vanessa Simmering, University of Iowa

Summary: Computational models have played a substantive role in the study of cognitive science for decades. Within the domain of cognitive development, however, formal models are still relatively uncommon. In part, this reflects the unique challenges of modeling developmental process: models must change over multiple time scales, and they must be exquisitely sensitive to variability, to context, and to past history. In the last decade, several theoretical frameworks (e.g., connectionism, dynamic systems theory) have demonstrated that they can effectively tackle the unique challenges of development. This raises the central question of this symposium: should the field of cognitive development embrace formal models of development? If so, how do we balance the potential costs and benefits of computational models with the long, productive history of rigorous empirical work motivated largely by conceptual theories?

To evaluate these questions, this symposium brings together both modelers and non-modelers from two research domains—visual cognition and social cognition. In recent years there have been rapid developments in these domains on both theoretical and empirical fronts. Thus, these fields provide rich material for exploring the benefits and drawbacks of using computational models to understand cognitive development. The inclusion of speakers from separate domains emphasizes the generality of the issues at hand. To conclude, the discussant will synthesize the arguments presented by the four speakers, and discuss how these perspectives may impact future research in cognitive development.

Development of Visual Cognition: No Pressing Need to model Results of Shape-specific Scale Error Studies

Peter Vishton, Natalie H. Brito, and Kaitlin L. Brunick, College of William & Mary

Science progresses by collecting observations, developing theories to explain the observations, and refining theories on the basis of additional observation. In developmental science, theories have typically been presented in the form of prose descriptions. Computational models (CMs) provide an alternative, more precise language for stating theories. In any CM, the sources of relevant information and the methods of processing that information are formally stated and operationalized. The predictions made by a CM are also more specific, making theories easier to evaluate and, when appropriate, falsify. This property can lead to a shorter cycle of theory refinement. However, CMs require more start-up costs and can obfuscate simple results within the complexity of the model itself.

We will consider this in the context of results in the domain 2.5-year-olds' "scale errors": actions that are appropriate to the shape of objects but inappropriate to their size. For instance, children at this age may attempt to put a doll-sized shoe on their foot or step into a miniature toy car. In our studies, after children reached for a small cylinder with one hand, they were significantly more likely to reach for a large version of the cylinder in the same way. If the size change was accompanied by a shape change, however, children more frequently engaged in an appropriate two-handed reach. A CM could be developed to account for this phenomenon, but it seems unlikely to enhance our understanding of it, at least at this stage of experimentation.

A Theoretical Framework for Modeling the Development of Visual Cognition

Vanessa R. Simmering, John P. Spencer, and Evelina Dineva, University of Iowa

Human behavior demonstrates remarkable associative abilities – we can associate multiple features to form objects (the shape and color of a banana), associate objects with labels (learning new words) and actions (using chopsticks), even associate objects with locations (finding a spoon in someone else's kitchen). How are such associations built up from experience, and what type of real-time, embodied system would allow such associations to form quickly and efficiently? In our talk, we will present a theoretical framework—the dynamic field theory—that confronts the dual challenges of driving the behavior of a real-time, embodied system and forming novel associations quickly over time. Critically, this framework has shed new light on seemingly disconnected findings—from the use of space to associate objects and labels separated in time, to the formation of imitative tendencies by associating actions with object features. These examples highlight one of the key features of formal theories—the integration of disparate observations.

We will also discuss a second key feature of formal developmental theories—to shed light on what is developing. On this front, our emphasis on the real-time details that bring together perception, action, and cognition place strong constraints on proposals about developmental change, revealing that a relatively simple developmental change—an increase in the precision and stability of neural processes—can do a great deal of developmental work. We conclude by taking the stance that development may simply be too complex to understand without formal theories. That said, such understanding can only come by balancing the strengths of clever, novel experimentation with systematic theory development and model testing.

Development of Gaze Following and Joint Visual Attention

Chris Moore, Dalhousie University

Gaze following or joint visual attention is a fundamental aspect of the triadic or object centered interactions that characterize infant social behavior during the latter half of the first year. Gaze following in infants has been studied in three main ways. First there have been manipulations of the gaze cues that infants are exposed to. Second, there have been manipulations of the spatial layout of targets in relation to the environment. Third, there have been manipulations of target type and salience. Results reveal a protracted developmental pattern from about 6 to 18 months. Young infants follow gaze primarily on the basis of head turns only when salient targets are fully in view. Infants gradually learn the significance of eye direction and become able to follow gaze even when targets are hidden or absent altogether. A review of existing research on gaze following suggests that a developmental account based on the entrainment of visual spatial attention and the learning of the predictive value of gaze cues in relation to possible target locations is most consistent with the overall pattern of results in this literature. As this empirical review shows, we've made substantial advances in our understanding of the development of gaze following through rigorous experimentation with parents and infants. I will conclude my talk by looking to the future to evaluate how far this empirical approach can get us and what computational modeling might (or might not) add to the mix.

Modeling the Development of Gaze Following

Jochen Triesch, Hector Jasso, and Gedeon O. Deak, University of California-San Diego

Despite a long history of empirical research, central questions about the development of gaze following have remained unanswered. Why do infants learn to follow gaze? What causes the improvement of gaze following ability with age? What do various competence levels in gaze following reveal about the infant's understanding of the intentional and referential nature of other people's looking behavior? While computational models will not be able to settle these questions, we think that they can provide an important contribution to the discussion. We will illustrate this by discussing recent efforts to model the development of gaze following with a biologically plausible reinforcement learning model. This model can qualitatively account for many of the behavioral findings. At the same time, it makes a number of novel and interesting predictions, such as the existence of a new class of mirror neurons for looking behaviors. It bridges time scales from seconds (individual gaze shifts) to years (development of gaze following) and explains the observed behavioral change in terms of underlying changes to the neural substrate, offering a parsimonious account of a specific aspect of infant social development.

Questions in Development: The View from Cognitive Science

Discussant: *Rob Goldstone, Indiana University*

SATURDAY, OCTOBER 27, 2007: 4:00 – 5:45 PM

NEW DIRECTIONS IN PRETEND PLAY RESEARCH

ORGANIZER: Deena Skolnick Weisberg, Yale University

SUMMARY: Young children spend much of their time engaged in pretend play with objects and situations they know are not real. Far from being a frivolous activity, pretense is a fundamental part of children's cognitive development; indeed, its absence is a diagnostic signal for autism. There are many links between pretending and other cognitive skills, including theory of mind understanding, counterfactual reasoning, and general representational abilities, but these links are as yet poorly understood. The three talks in this symposium explore these issues by describing the various forms that pretense can take and by investigating the crucial functions that pretense can serve in development.

The symposium participants have many years of experience in researching pretend play from a variety of theoretical backgrounds. Marjorie Taylor's and Alison Shawber's groundbreaking research has illuminated children's relationships with their imaginary companions and the cognitive and social underpinnings of these relationships. Karen Neary, Ori Friedman, and Alan Leslie study the mechanisms behind pretense. Their current research investigates how children interpret the characteristic speech patterns in pretense, expanding our knowledge of how children comprehend and produce pretend acts. Judy DeLoache is best known for her work on children's understanding of maps and scale models, but her recent work on children's scale errors raises questions about the nature of children's representational abilities in realistic and pretend contexts. These three talks will be followed by commentary from Deena Skolnick Weisberg, whose research focuses on the unexpected and nuanced cognitive structures that underlie pretend play behavior.

THE DISTINCTION BETWEEN ROLE PLAY AND NON ROLE PLAY PRETENDING IN PRESCHOOL CHILDREN

Marjorie Taylor & Alison B. Shawber, University of Oregon

Pretend play includes diverse behaviors ranging from simple acts of object substitution in which a block stands for a car to elaborate superhero scenarios. Individual differences in pretend play have important connections with social and cognitive development, but it is challenging to interpret the diverse findings in this area. One problem is that there is no widely used assessment that captures the distinctions considered to be important in current theories of imagination. The research to be presented here was guided by Harris's (2000) theory distinguishing role play in which children imagine and act out the part of another person or creature from non role play pretending.

In this study we streamlined a procedure for coordinating parent and child interviews about (1) personified objects in which the child creates a role that is projected onto a toy, (2) pretend identities in which the child acts out an imagined character using the self as a vehicle, and (3) invisible friends in which the child interacts with a character but does not rely on environmental support. We also included a new behavioral role play task and an assessment of non role play pretending. The results with 200 preschool children suggest that non role play and role play pretending have distinct roles in development. Non role play pretending correlates with age and verbal comprehension, suggesting its connection to symbolic development, whereas role play correlated with children's ability to generate an imagined conversation and other variables related to their interest and engagement in social interaction.

TESTING BETWEEN MENTALIST AND BEHAVIORAL ACCOUNTS OF PRETENSE: EVIDENCE FROM PRESCHOOLERS' INTERPRETATION OF PRETEND-SPEECH

Karen R. Neary, University of Waterloo, Ori Friedman, and Alan M. Leslie, Rutgers University

Are young children mentalists or behaviorists about pretense? The mentalist account holds that children represent pretense via the mental state concept PRETEND. Behavioral accounts claim children lack this concept and instead view pretense as a kind of behavior, 'behaving-as-if'. The accounts differ in their predictions about how children interpret pretend sounds. Suppose, mother makes chewing sounds while 'feeding' a doll. How will the children interpret the sounds? If they are mentalists they will represent: mother PRETENDS the doll makes the sounds. But children will be challenged if they are behaviorists about pretense: When making the chewing sounds, mother does not behave-as-if the bear is eating, instead she behaves-as-if she were eating.

As the above example shows, behavioral accounts have difficulty explaining children's ability to represent pretend sounds as coming from counterfactual sources (from the bear rather than from the actor). But do children really have this ability? We investigated this question, thereby testing between mentalist and behavioral accounts. Children listened to requests, some spoken normally (no pretense) and others in a high-pitched voice with the pretense that a teddy bear was uttering them. To correctly fulfill the requests, children had to represent the normal utterance as the actor's, and the high-pitched utterances as originating

from the bear. Children succeeded at ages two and three. These findings suggest that young children are mentalists, not behaviorists, about pretense.

Dual Representation in Pretense and Scale Errors

Judy S. DeLoache, University of Virginia

Dual representation is an important aspect of young children's interaction with symbolic objects and in particular their interaction with replica toys. It involves mentally representing a given object in two different ways at the same time.

In pretend play with replica objects, the young child manipulates an object as if it were something other than what it actually is. A toy bottle is carefully inserted into a doll's mouth as if it contained milk and the doll could drink. Such play depends on dual representation: While pretending, the child has in mind a real baby and bottle, and knowingly/intentionally uses the toy "as if" it were something other than itself.

In the commission of a scale error, young children also interact with miniature replica objects as if they were larger objects. However, scale errors involve serious attempts to use miniature objects as if they were their real counterparts. Crucially, the child actually tries to get into a miniature car or to sit on a tiny chair. Thus, scale errors involve a failure of dual representation, with the child's actions based on his or her mental representation of the real one.

The research to be presented includes a study directly comparing the nature of 18- to 30-month-olds' behavior in the spontaneous commission of scale errors with children's behavior when instructed to pretend with the same replica objects. The nature of the behaviors—in which dual representation serves very different roles—are markedly different.

Commentary: Future Directions for Pretend Play Research

Deena Skolnick Weisberg, Yale University

The three talks in this symposium explore the many ways in which children engage in representational pretend play as well as links between this behavior and other aspects of cognitive development. In this commentary, I aim to draw out several common threads from these research projects. All three talks rely on pretense being a representation of events that are not real. What is the nature of this representation? How do children view their own pretend activities, and how should their beliefs be taken into account in a theoretical analysis of pretend play? Also, how should pretense be understood theoretically? To what extent is it the expression of a basic mental state concept as opposed to just a behavioral sequence?

I will also connect the issues raised in these talks to other topics in cognitive development. For instance, pretend play is not the only form of play; children also explore objects playfully and engage in a variety of reality-based play activities. How do these different types of play relate to each other? Additionally, it would be interesting to explore whether the cognitive and social skills gained via pretense generalize into the child's life beyond the play context. Finally, what are the relationships between the kinds of representations deployed in pretend play and the representations that children may use to make causal inferences and to understand other minds?

Knowing About Ignorance: Children's Judgments and Nonverbal Behavior in the Face of Uncertainty

Organizer: Elizabeth Robinson, Warwick University, UK

Summary: The goals are to (i) move beyond established finding that children are more inclined than adults to over-estimate the knowledge gained from limited information, and (ii) raise interesting questions for discussion, concerning the processes underlying developmental differences in awareness of uncertainty. The topic is intrinsically important, since accurate monitoring of one's own uncertainty seems crucial for effective deliberate acquisition of knowledge. Additionally, the research has wider implications for accounts of implicit vs explicit understanding, the concept of realist errors, and our understanding of children's perspective-taking skills.

The set of participants, representing three countries, is appropriate because their presentations have an overall coherence while each makes unique points: Papers 1 and 2 examine how children's explicit judgments of certainty become adult-like. Paper 1 shows increasing concordance between objective uncertainty and subjective judgments, about guesses, deductive and inductive inferences. Paper 2 shows age-related change in apparently illogical behavior: Certainty ratings by both children and adults discriminate between events that are objectively equally uncertain, but discriminate in opposite ways. Papers 3 and 4 question whether children's inappropriate denials of uncertainty are in line with sensitivity to alternative possibilities. Paper 3 contrasts judgments and acknowledgment of possibilities about ambiguous figures and ambiguous utterances. Paper 4 contrasts children's explicit judgments with measures of implicit awareness.

Together the papers demonstrate that a complete picture of children's understanding of uncertainty, needs to include evidence

from events with different objective and subjective levels of certainty, and to contrast children's metacognitive evaluations with explicit and implicit acknowledgment of possibilities.

Children's Evaluation of the Certainty of Inferences

Bradford Pillow, Northern Illinois University

The first set of experiments included participants from kindergarten through fourth-grade and adults. It investigated recognition of differences among deductive inferences, inductive inferences based on strong or weak evidence, and guesses based on some or no evidence. Participants made inferences and guesses about the color of a hidden toy, then rated their certainty about their conclusion and explained how they reached it. Results indicated a gradual differentiation among deduction, induction, and guessing, although only adults distinguished between strong inductions and weak inductions. By fourth grade children gave appropriate explanations for conclusions reached by deduction or induction.

The second set of experiments, with participants from kindergarten, 1st-, 3rd-, and 4th-grades, assessed recognition that another person's level of certainty about an induction conclusion may (i) vary according to the strength of the supporting evidence, and (ii) contrast with what the child knows to be true. Children observed a puppet make strong inductions, weak inductions, or guesses about a hidden object, and rated the puppet's certainty in its conclusion. Children knew what pattern of evidence was available to the puppet and whether the puppet's conclusion was correct or incorrect. Younger children tended to base certainty ratings on the correctness of the puppet's conclusion rather than on the strength of the evidence available to the puppet. Children have difficulty applying their understanding of inferential reasoning when evaluating the thoughts of another person who does not share their perspective.

Children prefer to guess about determined rather than undetermined outcomes

Elizabeth Robinson, Warwick University, UK

Children's over-estimation of knowledge in the face of uncertainty is well-documented. Typically in this research, the state of affairs about which children are ignorant, but judge they know, already exists. We confirm over-estimation of knowledge in such circumstances, but show that it is ameliorated for an outcome yet to be determined. In Experiment 1, 5- to 6-year olds ($N = 88$) judged how sure they were about (i) which of one two toys the Experimenter had hidden behind his back, or (ii) which one of the two he was about to pick from a bag. Children rated themselves as more sure in condition (i), mean score 3.25 out of 5, than in condition (ii), mean score 2.66 ($p = .03$). In Experiment 2, children indicated whether they preferred to guess the outcome of the fall of a die before it had been thrown, or after it had been thrown but remained hidden. Five- to 6-year-olds ($N = 64$) strongly preferred to guess after the die had been thrown ($p = .004$), suggesting that they felt more sure what the outcome was in that condition.

The results suggest that children's knowledge that there is something to be known, makes it particularly hard from them to realise that it is unknown to them.

Interestingly, in a paper-and-pencil version of the die-fall prediction task, adults showed the opposite pattern, preferring to guess before the die was thrown. This is in line with the literature on adults' gambling preferences. We discuss possible developmental accounts

What can ambiguous figures tell us about children's understanding of uncertainty?

Sarah Beck, Birmingham University, UK

Five- year- olds experience the phenomenon of ambiguous figure reversals, where a picture appears to flip between two interpretations, e.g. a duck and rabbit (Gopnik & Rosati, 2001) and they find it easy to give an alternative interpretation of ambiguous figures (Doherty & Wimmer's production task, 2005). These figures may offer 5- and 6- year olds an easy way in to acknowledging uncertainty about how ambiguous input should be interpreted. In Experiment 1 we used the production task: Children had to give an alternative interpretation to that given by the Experimenter. This was as easy with ambiguous messages as with ambiguous figures. It was much more difficult for children to acknowledge that they could not know for certain the intended interpretation of an ambiguous message. In Experiment 2 we compared performance on the production task with that on a thought bubble task in which children had to identify what a person who saw an ambiguous figure would think. As before, children found it easy to give an alternative interpretation of the ambiguous figure, but they consistently rejected the uncertain thought bubble, which depicted someone thinking about a duck or a rabbit. Five- and 6- year olds find it easy to switch between alternative interpretations of an ambiguous input, but are unable to acknowledge the uncertainty that arises because of the existence of these alternative possibilities. We discuss this in the light of recent work on children's handling of determined and undetermined possibilities, and children's implicit understanding of ambiguity.

Preschoolers' Sensitivity to Referential Ambiguity

Elizabeth Nilsen, University of Waterloo, Canada

Children younger than 5 tend to judge ambiguous messages as unambiguous, particularly when they are aware of the intended meaning (e.g., Sodian, 1988). The goals of the present study were: first, to investigate preschoolers' implicit (indicated by eye fixation patterns and latencies) and explicit (indicated by actions) sensitivity to referential ambiguity and second, to assess whether a child's privileged knowledge interferes with his/her ability to detect message ambiguity from a naïve other's perspective. Four-year-olds participated in a message evaluation task wherein they had to assess an adult listener's knowledge of the location of a hidden sticker after the listener was provided with an ambiguous or unambiguous description of the sticker location. On half of the trials, children were aware of the location of the sticker whereas on the remaining trials, they were unaware of the sticker's location.

When preschoolers possessed privileged knowledge about the sticker location, their explicit judgments indicated they viewed a description to be unambiguous, even when that description was ambiguous from the listener's perspective. However, measures of implicit awareness demonstrated that even when preschoolers had privileged knowledge about the sticker location, ambiguous messages led to more consideration of an alternative location and longer response latencies than unambiguous messages. These findings demonstrate that children can detect referential ambiguity in language directed to others even when their own knowledge clarifies the intended meaning of a message.

Learning by Doing: the Role of Exploratory Play in Cognitive Development

Organizer: Elizabeth Bonawitz, Massachusetts Institute of Technology

Summary: Although it is widely accepted that children 'learn by doing' and that children's exploratory play is critical for development, there are diverse definitions of play and little is known about how children's exploratory play might provide evidence that could support learning. Indeed, there have been few findings of systematic patterns in children's exploratory play and considerable research suggests that children do not spontaneously design informative experiments. Nonetheless, research across a range of fields suggests that play is critical to cognitive development. This symposium bridges work in educational psychology, machine learning, and cognitive science to examine the role of exploration in children's learning.

Specifically, this symposium looks at how parents and educators evaluate children's play, how exploration may be computationally optimal, how play shapes categorization and reasoning, and how spontaneous exploration is shaped by evidence and prior knowledge. Our first speaker discusses disagreement between mothers and experts in the nature and value of play. Our second speaker will present approaches from machine learning aimed at discovering efficient, effective exploration. Our third speaker presents research suggesting that children's categorization and inferences are influenced by their exploratory play. Finally, our fourth speaker suggests that children's exploratory play is formally rational, in that children integrate prior knowledge and evidence in making decisions about exploratory play, much as they do in making causal judgments. By addressing the problem of children's exploration from these different perspectives, we hope to provide a broad and unique contribution to our understanding of children's play behavior.

Mother Versus Expert Beliefs: Disagreement in the Nature and Value of Play

Kelly Fisher, Temple University; Kathy Hirsh-Pasek, Temple University; Roberta Golinkoff, University of Delaware

The current research examined parental and early childcare expert beliefs about the nature of play and how such play activities relate to academic learning. Mothers (1130) and experts (99) rated 27 common childhood activities individually on (1) their classification as play or nonplay behavior and (2) their influence on future academic learning. Two categories of play activities emerged from parent ratings: unstructured play (e.g., free play such as blocks, dress up) and structured play (e.g., reading books, using computers). The majority of mothers (54%) classified all activities as play while 46% viewed unstructured activities as most playful and structured activities as less playful. Mothers believed all play activities had inherent academic learning value; however, unstructured play had less learning potential compared to structured activities. A seeming antithesis to parental perceptions, professionals viewed structured activities as non-play behavior. Further, professionals acknowledged more learning value in unstructured play compared to its counterpart.

Our findings highlight the existence of a conceptual disparity in society. Experts see strong, inherent differences in unstructured and structured play. In contrast, the majority of mothers do not clearly delineate these forms of play; rather, they view all activities as playful. This conceptual disparity may provide one answer for the seeming move toward structured play in the U.S. A broadening view of play may result in a society that identifies more behavior as playful with less delineation in types of play—allowing for an increase in structure in children's lives in educational and home settings.

Reward bonuses for efficient, effective exploration

Michael L. Littman, Rutgers University

Children must strike a balance between taking the time to perfectly understand their environment and taking advantage of what they already know. Viewed mathematically, solving this exploration-exploitation dilemma is computationally difficult, even in the case in which the environment simply consists of two unknown values (so-called 'bandit' problems). Natural environments present an even more challenging problem because the number of possible events to consider learning about vastly outnumbers the opportunities to explore. In practice, children can never completely experience their world, but nonetheless need to understand it well enough to navigate, make predictions, and explain the events around them.

The exploration-exploitation dilemma has long been recognized in the engineering disciplines as a problem that learning systems must face. Recent work in computer science has highlighted the importance of retreating from perfect optimality and settling for 'good enough' solutions. This talk will survey some new developments in machine learning that introduce reward bonuses for insufficiently explored states and show that the resulting learning algorithms balance exploration and exploitation while remaining computationally tractable. They can also search hypotheses spaces, even given noisy experience, to find rules that allow them to make predictions in the absence of exhaustive experience. These computationally tractable solutions from the artificial intelligence community could provide insight on the potential limitations, constraints, and mechanisms that may shape children's exploration and understanding of the world.

The Influence of Personal Exploration on Young Children's Artifact Categorization

Brenda Phillips, Deborah Kelemen, Krista Casler & Rebecca Seston, Boston University

Our presentation explores how young children reason about artifacts by examining the specific conditions needed for toddlers to construe tools in terms of particular functions. In particular, we examine how first-hand exploration influences children's functional categorization of artifacts.

Our general method involves presenting children with two physically dissimilar but functionally equivalent novel tools. Children briefly see an adult use one tool to perform a task (e.g., "bell box" activation) but receive no function information about the other tool although act upon it and manipulate it equivalently. Children are asked to choose between the tools to perform the demonstrated task and an alternative food-crushing task on eight trials, across two days of testing.

Our past research has revealed that 2.5-year-olds–after seeing just one intentional demonstration by the model and having one try themselves–become functionally fixed. They consistently return to the demonstrated tool for box-activation and avoid using it for alternative purposes. Additional research has now indicated, however, that certain learning conditions must hold for 2.5-year-olds to display this fixedness pattern. In short, if 2.5-year-olds are not given hands-on experience they display a pattern of flexibility, transiently viewing an artifact's function relative to the current, situational need. Thus, like monkeys, they use any tool for any task as long as it is physically viable.

These findings suggest that the absence of exploratory play reduces toddlers' abilities to make enduring stable function-based artifact categorizations. The implications of these results for understanding children's artifact knowledge will be discussed.

The Role of Theories and Evidence in Children's Spontaneous Exploratory Play

Elizabeth Baraff Bonawitz & Laura Schulz, Massachusetts Institute of Technology

In this talk we show that, given identical evidence, children with different naïve theories exhibit different patterns of exploratory play. Karmiloff-Smith & Inhelder (1974) demonstrated that before children develop an adult 'Mass Theory' of balance, they entertain a 'Center Theory', believing that all objects should be balanced at their geometric center. Even younger, 'No Theory' children balance blocks by trial and error. In Experiment 1 we let Mass Theorists and Center Theorists play with a block that was weighted off to one side. We then "balanced" the block on a post either at the block's geometric center or at its center of mass. (Thus evidence that was theory-consistent for a Center Theorist was theory-violating for a Mass Theorist and vice versa.) We also introduced a novel toy (a peg and rings). Children were allowed to play freely for 60 seconds. When the evidence about the balancing block was consistent with the children's theories, they showed a standard novelty preference and played mostly with the novel toy. When the evidence violated children's theories, they preferentially played with the balancing blocks. In Experiment 2, we replicated the design with younger, No-Theory children; they showed a novelty preference regardless of whether the block was balanced in its geometric center or center of mass. These results suggest that children's spontaneous exploratory play is systematically affected by the interaction of their naïve theories and the evidence they observe. We discuss these results in terms of the optimality of children's play.