Preschoolers' Perceptions and Interpretations of Social Interactions

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Social interaction is a vital part of human life. In fact, our overall success depends on our ability to navigate the complexities of social interactions by adhering to social norms, interpreting others' intentions, and drawing conclusions concerning other individuals' relationships to ourselves and others. A person acquires these skills early in life and develops them throughout his or her lifetime. These social judgments form the basis for morality. We expect people to interact with others in the ways we would like to be interacted with, and we judge other individuals based on the way they interact with us and with others.

Adults tend to interpret social interactions in positive and negative terms. They perceive positive social interactions as ones in which multiple individuals behave in socially acceptable ways by following social norms, behaving appropriately towards one another; they perceive negative social interactions as ones in which individuals behave in unacceptable ways, potentially causing unfairness or pain (Premack). We also judge individuals who take part in negative social interactions as possessing negative dispositions. We say a person who does a mean thing to someone else is a mean person. Alternately, people who do nice things are considered nice people. Once we have determined whether a person is nice or mean, we behave in particular ways towards them. We may choose to approach and befriend nice people and ostracize those who are mean (Schubert, Waldzus and Seibt). It is important to make accurate judgments of social interactions because

our relationships with the individuals involved are strongly influenced by the way we perceive their behavior towards ourselves or others.

One common way adults judge social interactions is according to group membership of the individuals involved. We place people into groups, which can be as narrow as a family unit or as broad as a national or ethnic community. We do this by finding a common substance (either literal or abstract) among them (Schubert, Waldzus, and Seibt). Family members share a literal common substance (blood or DNA), while all Americans might be perceived to share a more abstract substance like a belief in the right of freedom. We then use these perceptions of group membership to form expectations about others' behavior and to treat in-group members differently from those of an out-group.

A second, equally important determinant in our understanding of social interaction is perceived social hierarchy. Social hierarchy judgments can be made in many ways, but one of the most clearly documented indicators of relative power is size (Schubert, Waldzus, and Seibt). Individuals who are bigger are perceived as stronger, more dominant, and more powerful, likely because of their ability to physically control smaller individuals. If we see that one object is smaller than another, we are likely to say that the smaller one is weaker, using simple visual cues of height and/or width differences.

Interactions can be differently interpreted based on the relative power each participant has over the other. For example, Fiddick and Cummins demonstrated that judgments of fairness are influenced by the concept of "noblesse oblige," in which higher status individuals have certain obligations towards lower status individuals. A high-status individual is expected to tolerate cheating much more from a low-status individual, and cheating by a more powerful individual is perceived as more unfair than cheating by a weaker individual (Fiddick and Cummins).

Since social judgments are so fundamental, it seems logical that humans would develop the skills to make them very early in life. For instance, there is evidence that the ability to interpret group membership begins in infanthood. According to Premack and Premack ("Moral Belief"), infants tend to automatically group objects based on physical similarity and voluntary co-movement. Objects with physical

similarity, of the same color, for example, may be grouped together because of a literal common substance they share: the pigments that make up their appearance. Multiple objects moving together without any one forcing another can be seen as a group because the lack of coercion demonstrates their equality and common goals. Once group membership is established, infants expect members of the same group to be nice to one another and to behave in consistent ways with one another (Premack). Specifically, they expect them to behave in ways that facilitate, and don't thwart, goal achievement.

There is also evidence that, like adults, infants associate size with social hierarchy status and have expectations about the behaviors of individuals based on relative hierarchy (Thomsen et al.). Furthermore, infants appear to prefer individuals who have a higher social status, or those owning better materials or possessing stronger skills. In a study by Horwitz, Pietraszewkski, and Wynn infants were habituated to one of two sets of puppets. In the first set, one puppet had more bananas than the other. In the second set, one puppet skillfully used a tool while the other failed at using it. When given the choice to play with one of the puppets, the majority of infants chose the "wealthy" or "skilled" one. Both of these characteristics are indicative of a social hierarchy difference between the puppet that was chosen and the one that was not (Horwitz, Pietraszewski, and Wynn). Since children are highly dependent on the resources and skills of others, they may be more likely to prefer (and excuse negative behaviors of) successful adults.

There is evidence that the ability to attribute overall positive and negative value to social interactions has its roots in infanthood, as well. In a pioneer study, Premack and Premack ("Infants Attribute Value") demonstrated that infants could differentiate between interactions based on visual cues implying a positive or negative value. They were shown clips of circles participating in either positive social interaction (helping or caressing) or negative social interaction (hindering or pushing). The positive and negative visual cues for the caressing and pushing clips dealt with the intensity of the motion. A high intensity motion (rough, fast, and high force, causing distortion in the shape of the other participant) was regarded as negative while a low intensity motion (gentle, slow, and weak) was regarded as positive.

Each infant was habituated to one of the four social interaction clips and then shown a second one immediately after. When they were originally habituated to a positive interaction, they continued to be habituated, or showed less interest by diverting attention, when shown a second positive interaction clip involving a new type of interaction. Habituation was maintained for consecutive negative clips, as well. Alternately, when habituated to a positive interaction first, the infants dishabituated, or paid closer attention to, to a negative interaction; showing a negative clip first did not lead to habituation for a subsequent positive clip, either. The helping and hindering clips were visually very different from the caressing and pushing clips, so continued habituation between helping and caressing or between hindering and pushing suggests that the infants were using the positive and negative value cues to form their judgments (Premack and Premack, "Infants Attribute Value").

Assuming social perception begins in infanthood, social judgment capabilities and value attribution should be found within childhood populations, as well. We also expect that these skills would improve, involving more complex, consistent judgment criteria, through development. There is recent evidence suggesting that young children judge others based on their group membership. For example, young children are more likely to believe information given to them by a consensus instead of by an individual who was not part of the group (Chen, Corriveau, and Harris, "Examining the Impact of Race"). However, this likelihood changes if the consensus comes from people who are not part of the participant's in-group, such as those of a different race (Chen, Corriveau, and Harris, "A Cross-Cultural Examination"). Furthermore, there is evidence that young children show in-group bias, accepting a behavior from their in-group member that they reject from an out-group member (Schug et al.), and expect other in-group members to make the same differential judgments (Hitti et al.; Makariev and Lagattuta, "Children's Reasoning"; Makariev and Lagattuta, "Intergroup Relations").

In our present study, we followed up on Premack and Premack's research ("Infants Attribute Value") to test whether preschool children (between the ages of 2 and 5) are capable of understanding, interpreting, and describing videos of characters socially interacting,

and if these interpretations are sensitive to manipulations of in-group and hierarchy cues. In our animated videos, we manipulated the types and valences of the interactions our characters (animated spheres) participated in. We also manipulated the color and relative size of the characters in order to see if children would use these qualities to make judgments concerning group membership and social hierarchy, respectively. We were interested in gathering the qualitative interpretations that preschool-aged children, unlike infants, are able to verbalize.

Many preschool children refer to in-group/out-group relationships (e.g., playing cowboys and Indians) and to hierarchy (e.g., pretending to be teacher and student or parent and child) while engaging in pretend play, but less is known about how children understand these relationship dynamics and their relativity to social behaviors. By encouraging the children to assign character relationships to the interacting spheres in our videos, we hoped to better understand the way they interpreted our color and size cues in accordance to group membership and hierarchy. If preschool-aged children interpreted group membership in a similar way to adults, we would expect children to assign group identifications based on similar characteristics (e.g., color). A child could say that two same-color individuals were members of the same group, for example, the same gender, or on the same sports team. Alternately, individuals that were different colors from one another may be assigned opposite genders or be on different teams. We would also find it appropriate for a child to refer to hierarchy relationships between different-sized individuals. For example, a child could say that a large individual was a parent or teacher, a small individual was a baby or child, and two same-sized individuals were friends. We were further interested in the extent to which these interpretations of relationship would affect the valence they attribute to the interactions and characters involved in their stories. Even if the valence cues we assigned to the clips were consistent, we may expect a parent-child interaction to be "nice," consistent with "noblesse oblige," and a boy-girl interaction to be "mean," consistent with between-group tension.

We performed two experiments at the Early Childhood Development Center (ECDC) at the College of Charleston. During the first experiment, children observed video clips involving interactions

between two individuals; during the second experiment, children observed interactions between a group and an individual. The second experiment was designed in an attempt to replicate the findings of the first and to heighten sensitivity to group identification dynamics (to elaborate upon how the perceived dynamics change once additional characters became involved).

Our most fundamental prediction for both experiments was that children would attribute agency to self-propelled objects and goal-directed behavior to their movements. If they did not attribute agency, no social perceptions could be made for these particular videos. We further predicted that children would notice differences in color and size between two interacting spheres and if they noticed these differences, would take them as proxies for group membership (same color representing same group, different colors representing different groups) and social hierarchy (larger being dominant and more powerful, smaller being subordinate and weaker). We also predicted that children would be able to identify and describe the type of interaction we were depicting in our videos and that they would attribute the appropriate positive or negative valence to both the interaction and to the characters involved. Finally, we predicted that four- and five-year-olds would verbally incorporate these types of judgments into their stories more often and more accurately than two- and three-year-olds.

Experiment 1

Children were shown video clips of *Helping, Interfering, Playing* and *Chasing* interactions between two individuals during this experiment. Visual cues for relative size, relative color, and valence (positive/negative) were manipulated. The children's stories were interpreted on the basis of valence attributions, relationship assignments, and differential valence interpretations based on in-group/out-group membership status.

Methods

Participants. We recruited preschool children at the Miles Early Childhood Development Center (ECDC) in Charleston, South Carolina. Thirty-seven children were attending ECDC at the time of the study; of these, 35 returned permission forms granting approval from parents for participation and two declined participation. All

children were between two and five years old and were organized into three classrooms according to age. The groups for the research were determined by the pre-established classes. In total, there were 17 four- to five-year-olds and 9 three-year-olds included in our study. Children from the two-year-old sample did not have the vocabulary to be included in our analyses. During the weeks preceding the trials, we encouraged the children to be more comfortable speaking to us by making occasional visits to ECDC to interact with them.

Materials. Each participant viewed a series of 10-second video clips created with the Maxon computer graphics program Cinema 4D Studio. The children watched all videos on a standard laptop screen. The sessions were continuously video and/or audio recorded, depending on parental consent, for subsequent transcription purposes.

Design. All video clips contained two self-propelled spheres interacting with one another, so the first manipulated variable was the type of interaction. There were 6 total interaction types, which were divided into three sets of two complementary clips. Both interactions in each set consisted of similar movements, but were designed so that opposite valences could be attributed to them. The categories were *Helping/Interfering* and *Playing/Chasing*. In order to manipulate two additional variables, group membership and social hierarchy, each interaction type was replicated into four separate clips containing different visual cue combinations of same and different colors (representing in-group/out-group status) and sizes (social hierarchy).

We used a within-subjects design, showing each participant multiple video clips in order to determine how the children's interpretations were influenced by the differences between clips with respect to both interaction type and visual cue. The initial clip for all participants was a same color/same size visual cue. Each series alternated between positive and negative interaction types, and the order of clips shown to each child was counterbalanced within the age groups.

"*Helping*" and "*Interfering*," the most complicated interactions used for this study, both involved one self-propelled sphere attempting to push a target ball up a ramp. For the *Helping* clip, approximately halfway to the top, the sphere pushes the ball a little bit further up, but then comes back down. It repeats this motion a few times before a second self-propelled sphere moves behind the original and pushes

both the original sphere (the second sphere's target) and the ball completely up the ramp. Together, they push the ball off the end of the ramp and the two spheres bounce in place at the top. Our intended interpretation was that the original sphere was trying unsuccessfully to roll the ball to the top of a ramp. After repeated failures, a second sphere helps the original sphere. Together, they push the ball off the side and jump in celebration of their accomplishment. For *Interfering*, the original sphere again rolls approximately halfway up the ramp several times but this time, the second sphere jumps in front of the original sphere and its ball. Then, the second sphere moves down the ramp, pushing the original sphere and the ball down with it. Here, the intended interpretation was that the original sphere was trying to roll up the ramp with its ball until a second sphere interfered with this goal, pushing it and its ball back down the ramp.

   Playing and *Chasing* took place on an empty backdrop. In *Playing*, the two spheres jump over one another repeatedly then move together around the screen. It appeared that the spheres were playing some type of game, such as leapfrog, and then moved around the area as a pair. In *Chasing*, one sphere follows a second, mimicking its path. The spheres move much more rapidly (with higher intensity) than in the previous clip. One sphere appears to be chasing another, who tries to get away.

   The visual cues, or combinations of color and size for each interaction, were as follows: two spheres of the same color and same size (SS), two spheres of the same color and different sizes (SD), two spheres of different colors and the same size (DS), and two spheres of different colors and different sizes (DD). In order to avoid pre-established associations with certain colors (blue for boys and pink for girls, for example), we chose color combinations with no obvious social group, especially gender, associations: *Helping/Interfering* involved red and purple spheres and *Playing/Chasing* involved green and yellow spheres. In clips including two differently sized spheres, one sphere was approximately 1.5 times the size of the other.

   Procedure. All trials, including the initial one, took place in the library at the ECDC with the same basic procedure. No other children were present while the trials were taking place. Participants were invited by a researcher to come into the room one at a time while the others

participated in the normal classroom activities occurring at the time. Once entering the room, the children were told that their parents said it was okay for them to watch clips with us, and asked if they would like to see the clips. If they affirmed, they sat in a small child's chair in front of a desk with a laptop. The screen of the laptop was adjusted according to their height, allowing them to clearly see the clips. Two researchers were present during the trials; one was responsible for prompting the child while the other took notes. The sessions were audio recorded and the children whose parents had given consent were video recorded. After viewing each clip, the children were asked to tell a story about what had happened in the clip. If at any point the child seemed bored or uncomfortable, they were asked if they wanted to continue. If they chose not to continue, they were taken back into their classroom and the next participant was invited.

In an attempt to familiarize researchers and participants with the experience and to test video and audio recording, researchers showed each child a series of two 5-second clips with no particular valence or visual cues associated with them. In these videos, one sphere rolled either down or up a ramp. After reaching the end, it was flattened by a cylinder. Each child viewed each clip approximately three times and was asked to tell a story about what they saw.

After that, two separate experimental trials took place across several days starting approximately a week after the preliminary trial. Participants were invited to view a new set of clips. Each clip was viewed fully once before the storytelling prompt was given. While the child narrated, the clip was repeated. If the child did not freely elaborate, additional prompts were given, such as "Are they friends?" "Are they being nice or mean?" and "What do you think those balls are doing?" Very few children saw all of the clips due to attention constraints, but all children who were included in the analyses viewed at least three of them on each trial day. All children who were present at the time of the trials were invited to participate, as long as parental permission had been received.

All visual cue combinations of the *Helping* and *Interfering* clips were shown during the first experimental trial. The prompt given during this trial involved some version of "Tell us a story about what is happening in this clip." During the first trial, we discovered that many

children were hesitant to assign character names or relationships to the animated spheres; many indicated that they were "just balls." To encourage pretend play and character assignment during the *Playing/ Chasing* clips, researchers used an additional prompt of "If you were pretending they were somebody, who do you think they would be?" along with the storytelling prompt.

A third researcher listened to the audio recordings and transcribed all of the children's stories during the weeks following the trials. This researcher was not present during original trials and did not know the order of interactions or visual cues given to each child. The notes taken during the original collection were used as a last resort if audio quality was especially poor or the child mumbled indistinguishably during particular parts of the recording. The two original researchers from the recording sessions were responsible for coding, which was based entirely on the transcriptions.

Analysis. Data was transcribed and coded by the researchers. We compared three-year-olds to four- and five-year-olds and males to females on many factors, including overall valence attribution, use of social identifiers, relationship changes, and identification of characters as in-group or out-group members relative to the child. For gender differences, we combined both age groups. All statistics were calculated using Microsoft Excel and SPSS.

Overall valence was interpreted based on children's use of positive and negative action words (e.g., "playing a game" as positive, "hitting" as negative), mental states (e.g., "loves" as positive, "doesn't like" as negative), and adjectives ("good" as positive, "bad" as negative) and their responses to the question "Are the characters being nice or mean?" If they did not give any indication of whether the interaction in the clip was positive or negative, it was coded as "ambivalent," and if the child indicated that it was some combination of positive and negative, it was coded as "both."

Use of social identifiers was interpreted based on the children's tendency to give "agentic" character assignments to the spheres in the video clips. ("Agentic" entities are capable of thought and self-propelled motion, e.g. humans, animals, cartoon characters.) Common social identifiers included, but were not limited to, "mommies," "babies," "kids," and "teachers." Some children also gave non-human

character assignments such as types of animals and fantasy characters. Relationship changes were determined by whether the child changed the character assignments between clips (e.g. "a mommy and baby" became "friends") and whether these changes corresponded to differences in visual cues for size, color, and our intended valence (e.g., *Playing and Helping* as positive, *Chasing* and *Interfering* as negative). In addition, we interpreted whether the relationship changes corresponding with color changes made sense as group membership changes and whether those corresponding with size changes made sense as hierarchy changes.

Finally, the character assignments were interpreted as in-group or out-group relative to the child. For example, most human characters, such as "kids," "students," or "family" were considered in-group because the social dynamics would be familiar to a preschool child. Alternately, non-human characters, such as "balls," animals, or fantasy characters were considered out-group from the child. We then assessed whether the children changed their valence interpretations in ways that were consistent with the in-group or out-group character assignments.

Results: Valence

Age differences. For most interactions, the valence interpretations of the three-year-olds did not differ from those of the four- and five-year-olds. However, the four- and five-year-olds tended to give a negatively valenced interpretation more often than the three-year-olds; these age differences were marginally significant. The first set of clips (Helping and Interfering) were interpreted negatively more often ($t(25)=1.780$ $p=0.087$) for the four- and five-year-olds than for the three-year-olds; specifically, the four- and five-year-olds attributed a negative valence to Interfering clips significantly more frequently than three-year-olds ($t(25)=1.894$, $p=0.070$). This means that the four- and five-year-olds were more willing to see the interactions as negative.

Both age groups attributed a positive valence most often to *Playing*, *Chasing*, and *Helping* clips, but their valence interpretations for *Interfering* clips were varied (see Figure 1). Both age groups frequently followed our valence, but four- and five-year-olds did so more than three-year-olds.

Gender differences. Females did not differ significantly in their valence attributions between clip types, but males frequently changed valence interpretations in ways that were consistent to our valence cues. Males

were significantly more likely to attribute a positive valence to *Helping* clips than to *Interfering* clips (t(8)=2.476, p=0.038). They also attributed a positive valence to *Playing* more often than *Chasing* (t(8)=2.000, p=0.081) and a negative valence to *Chasing* more often than *Playing* (t(8)=1.941, p=0.088).

Figure 1. Valence Interpretations.
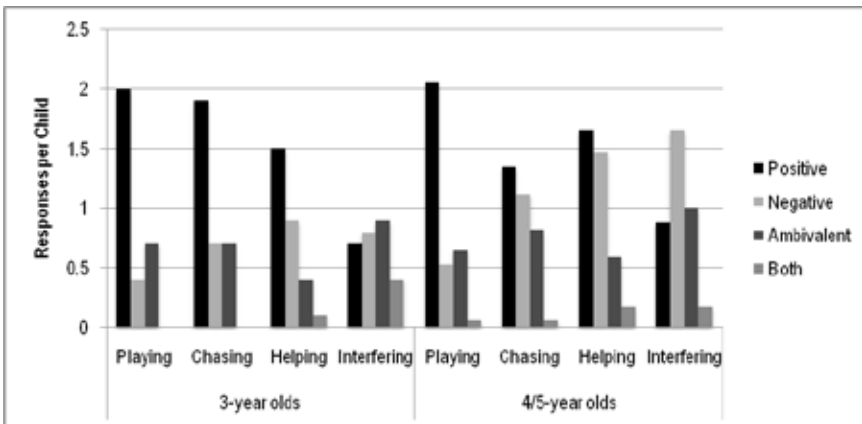
Use of social identifiers. Across the combined sets of video clips, the three-year-olds and four- and five-year-olds were equally likely to use social identifiers, or to give agentic character assignments to the interacting spheres. The three-year-olds were consistent in their tendencies to use social identifiers, but the four- and five-year-olds were significantly more likely to do so on the second set of clips (t(16)=3.771, p=0.002) (see Figure 2). Across both ages, more females used social identifiers on the *Playing* and *Chasing* clips than the *Helping* and *Interfering* clips (t(17)=2.38, p=0.029). There was a similar result for males, but it was not significant.

Results: Relationship Changes
Differences between age groups. Both age groups attributed relationships differently for the *Helping/Interfering* clips than for the *Playing/Chasing* clips (see Figure 3). More three-year-olds made overall relationship dynamic changes during the first set of clips than four- and five-year-olds (t(25)=1.77, p=0.099). Of these changes, significantly more

Figure 2. Use of Social Identifiers.
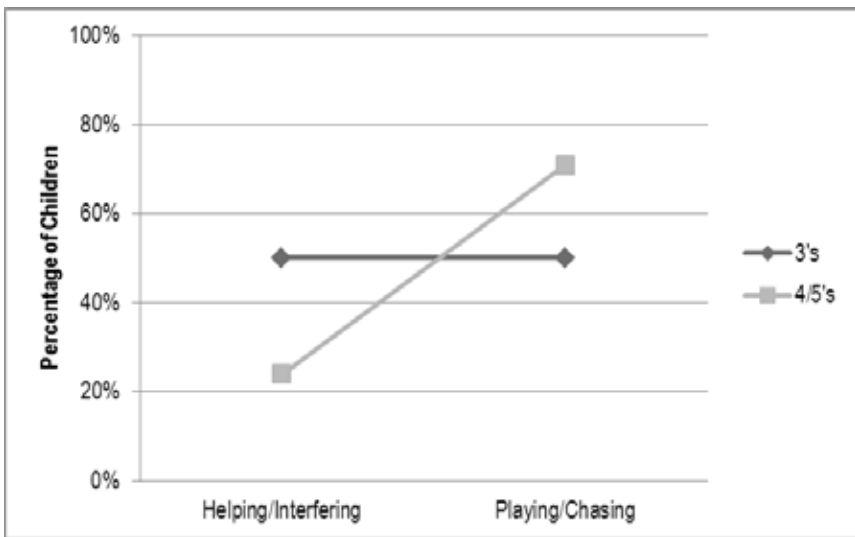
three-year-olds made changes corresponding to visual cues for size (t(25)=2.395, p=0.024) and color (t(25)=2.408, p=0.024) than four- and five-year-olds. Alternately, for the second set of clips, a higher percentage of four- and five-year-olds made overall changes in their relationship dynamics though this difference was not significant. Of these, significantly more four- and five-year-olds made changes corresponding to different visual cues for size (t(25)=2.802, p=0.010) and color (t(25)=2.567, p=0.017) than three-year-olds.

Less than 50% of children changed relationships in ways that were meaningful for group membership or hierarchy.

Differences within age groups. During the *Helping* and *Interfering* clips, more children from both age groups responded to size differences than the other visual cues. However, during the *Playing* and *Chasing* clips, there was a stronger emphasis on color than size differences for both age groups (see Figure 3).

There was no significant difference between the two sets of clips in the percentage of three-year-olds who made overall changes to the relationship dynamics, but three-year-olds were more likely to make changes in relationships that corresponded with our visual cues during the first set of clips than they were during the second set of clips (see

Figure 3). Significantly more three-year-olds changed relationships

Figure 3. Relationship Changes and Visual Cues for Playing and Chasing.
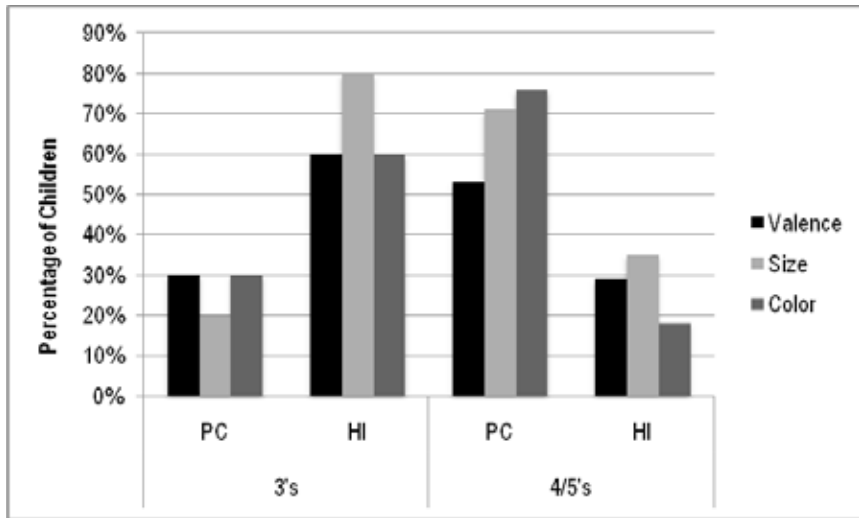
corresponding to size differences on the *Helping* and *Interfering* clips than on the *Playing* and *Chasing* clips (t(9)=3.674, p=0.005); a similar result was found for changes corresponding to color differences, but the finding was only marginally significant (t(9)=2.058, p=0.070).

Alternately, significantly more four- and five-years olds made overall changes in relationship dynamics that made sense during the *Helping* and *Interfering* clips than in the *Playing* and *Chasing* clips (t(16)=3.347, p=0.004). More of the children who made *Playing* and *Chasing* relationship changes were responding to differences in size (t(16)=2.073, p=0.055) and color (t(16)=4.781, p<0.001) than they did for *Helping* and *Interfering* clips (see Figure 3).

Gender differences. There were no significant differences between males and females on their tendencies to make relationship changes corresponding to visual cue differences. Significantly more females changed relationships overall during the second set of clips (89%) than the first set of clips (56%) (t(17)=2.380, p=0.029); of those who changed relationships, significantly more corresponded with changes in color cues (t(17)=2.715, p=0.015). There were no significant

differences between the responses from the two sets of clips for males.

Group membership relative to participant. We determined if there was any difference in valence attributions that corresponded to the characters' group membership as in-group or out-group to the child. There were no significant differences for three-year-olds, but four- and five-year-olds frequently judged the valence of the characters differently based on their group membership (see Figure 4). In all clip types, the out-group appeared to be negatively valenced more often than the in-group. For *Playing* clips, four- and five-year-olds attributed a positive valence to significantly more in-group members than to out-group members (t(16)=2.073, p=0.012). Furthermore, for *Helping* clips, they attributed a negative valence (t(16)=2.263, p=0.038) more frequently to out-group members than to in-group members. Finally, four- and five-year-olds attributed significantly more negative (t(16)=3.570, p=0.003) valences to out-group members than to in-group members for *Interfering* clips.

Figure 4. Four- and Five-year-olds's Group Membership and Valence Interpretations.
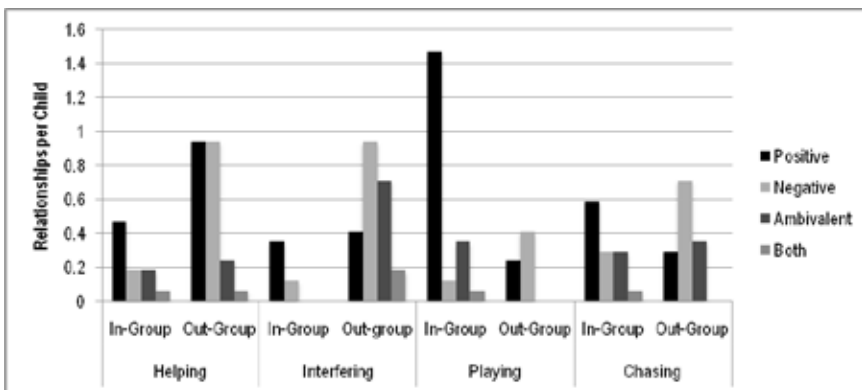
Discussion

Valence and the unexpected third character. Children from both age groups varied in their valence interpretations for the first set of video clips, Helping and Interfering, more than they did for their interpretations of the second set, Playing and Chasing. The Helping and Interfering interactions were more complex, in general, than the

others, which may have encouraged the children to consider these interactions more in-depth. We also discovered that many children attributed agency to the small ball that was being pushed by the original sphere in the first set of clips. We intended this to be an inanimate object, such as a toy, since it could not move without being pushed. Many children referred to this ball as a baby, something that has to be carried by someone else but still has feelings. When children referred to the target ball as an additional character, they frequently said that the original sphere was being mean by "trying to push the baby off of the ramp." There was sometimes a tension in the valence attributions with which individual was actually being helped or hindered. Using this sort of analysis, a sphere that pushed the original back down the ramp was being nice overall since it was protecting the baby, but it was still interfering with the original sphere's goal of pushing it off. Alternately, a sphere that helped the original was being mean to the baby but was helping the other focal sphere. The complexity of the first set of clips relative to the second is likely to explain the higher variability in attributions of valence.

Pretend play instructions and use of social identifiers. Our results indicate that equal numbers of three-year-olds gave agentic character assignments during each set of clips, but significantly more four- and five-year-olds only did so during the second set. During the *Helping* and *Interfering* clips, the majority of four- and five-year-olds said that the spheres were "just balls" and were reluctant to elaborate further. Though the previously discussed difference in complexity between the two sets of clips may have factored into this result, it is more likely due to the type of instructions the children received during each trial.

The day we showed *Helping* and *Interfering* clips, we did not offer explicit pretend play instructions. We asked the children to simply "tell us a story" rather than "pretend the balls are characters in a story." Regardless of the instructions, three-year-olds referred to social relationships approximately half of the time. Four- and five-year-olds referred to social relationships far less than three-year-olds when they did not receive pretend play instructions. However, they gave agentic character assignments more often than three-year-olds when they were encouraged to use their imagination while telling a story. When they were willing to engage in pretend play, their abilities to assign character

names and relationship dynamics were stronger than those of the three-year-olds.

Three-year-olds appeared to be performing at ceiling, or at the best of their abilities, for both sets of clips, while four- and five-year-olds were much more sensitive to the type of instructions they received. This suggests that, as children age, they become more reluctant to engage in pretend play without explicit instruction. They may have been trying harder during the first trial to interpret the video clip literally instead of using their imagination, perhaps out of fear of "being wrong. " However, their strong performance after receiving pretend play instructions suggests that, when they are encouraged to pretend, many more four- and five-year-olds are able to make creative character assignments than three-year-olds.

Experiment 2

For this experiment, we showed preschoolers video clips of *Approach Positive* and *Approach Negative* interactions between a group and an individual. We manipulated relative size and relative color visual cues to see how the children interpreted them. We analyzed their stories based on valence, character assignments and relationship dynamics, and group membership relative to the child. We also attempted to correct some of the previously discussed limitations from our first experiment, the unexpected third character and the impact of pretend play instructions. We hypothesized that, by using a group and individual, children would be more sensitive to relative color cues, and that group membership expectations would factor into their interpretations.

Methods

*Participants***.** We recruited preschool children at the Miles Early Childhood Development Center (ECDC) in Charleston, South Carolina for the second study, taking place during the spring semester of 2011. Forty-two students returned permission forms granting approval from parents for participation. All children were between two and five years old and were organized into three classrooms according to age. The groups for the research were determined by the pre-established classes. In total, 24 four- to five-year-olds, 15 three-year-olds, and three two-year-olds (18 total in our two- to three-year-old group) consented to

participation in our study. Some children were absent the days of our trials and others did not want to participate. The final sample sizes were 21 four- to five-year-olds and 12 two- to three- year olds.

Materials. Each participant viewed a series of 10-second video clips created with the Maxon computer graphics program Cinema 4D Studio. The children watched all videos on a standard laptop screen. The sessions were continuously video and/or audio recorded, depending on parental consent, for subsequent transcription purposes. Researchers who were not interacting with the child continuously took notes about the children's stories during the sessions.

Design. For the second study, all relevant video clips contained 6 self-propelled spheres interacting with one another. Five identical spheres were placed closely together on the screen at the beginning of the clip, bouncing in unison with one another. Identical appearance and synchronized motion were intended to make the 5 spheres appear to be a group. A sixth sphere later entered the scene from the corner of the screen. At that point, the group moves in synchrony into a straight line and surrounds the new individual.

Upon approaching the individual, the group interacted with it in one of two ways: positively or negatively. In the *"Approach Positive"* clips, the group bounced around the individual, and the individual started bouncing with the group in response. At the end of the clip, all spheres exited the scene in unison. Our intended interpretation was that the group approached the individual and accepted it into their group by interacting with it in a positive way (e.g., playing with it). We again used synchronized motion to imply positive interaction. Alternately, in the *"Approach Negative"* clips, the members of the group bump up against the new individual forcefully and repeatedly. At the end of the clip, the individual exits the screen by being pushed away by a member of the group. Our intended interpretation of this interaction was that the group approached the individual and rejected it from their group by hitting it and forcing it to leave. We used high intensity, rapid motion to make the movements appear to be negative.

Similar to the method used in the first study, we additionally manipulated group membership and social hierarchy cues. Both sets of videos were replicated into 6 separate clips containing different visual cue combinations of same and different colors (representing

in-group/out-group status) and sizes (social hierarchy). The visual cues, or combinations of color and size for each interaction, were as follows: the individual and the members of the group were the same color and same size (SS), the members of the group were a different color than the individual and all spheres were of the same size (DS), the individual and the members of the group were of the same color and the group members were larger than the individual (SD1), the individual and the members of the group were of the same color and the individual was larger than the group members (SD2), the members of the group were a different color than the individual and the group members were larger than the individual (DD1), and the members of the group were a different color than the individual and the individual was larger than the group members (DD2). The spheres for these clips were green or yellow. In clips including differently sized spheres, the larger spheres were approximately 1.5 times the size of the smaller ones.

Because the clips were very similar to one another, we included three distractor clips in each series shown to the children in order to prevent boredom. The distractor clips were unrelated to the *"Approach"* clips. These clips featured a small blue sphere rolling up or down a ramp, either alone (agentic motion) or by being moved by something else (nonagentic motion). At the end of the clip, the ball appeared to be flattened by a cylinder. In the *"Up Agent"* clip, the sphere bounced up and down multiple times before rolling up the ramp. Similarly, in the *"Down Agent"* clip, the sphere bounced up and down multiple times before rolling down the ramp. In the *"Nonagent Down 1"* clip, the sphere was lifted by a block that tilted and dropped the sphere down the ramp. In the *"Nonagent Down 2"* clip, a large sphere with a block carried the original sphere to the ramp and rolled it down. In the *"Nonagent Up"* clips, the sphere was pushed up the ramp by a block hitting it (*"Nonagent Up 1"*), or was pushed up the ramp by a block following it the entire way up (*"Nonagent Up 2"*).

We used a within-subjects design, showing each participant multiple video clips in order to determine how the children perceived the differences among clips. The first day of data collection, all children viewed the *"Approach Positive"* and *"Down"* clips, and the second day, they all viewed the *"Approach Negative"* and *"Up"* clips. The order of

clips was counterbalanced within the age groups. We attempted to show both sets of clips to all of the participants who were included in the study.

Procedure. All trials took place in the library at the ECDC with the same basic procedure as the first study. Participants were invited by a researcher to come into the room one at a time while the others participated in the normal classroom activities occurring at the time. Once they entered the room, the children were told that their parents said it was okay for them to watch clips with us. They were then asked if they would like to see the clips. If they affirmed, they sat in a small child's chair in front of a desk with a laptop. The screen of the laptop was adjusted according to their height, allowing them to clearly see the clips. Three researchers were present during the trials; one was responsible for prompting the child while the other two the other took notes. The sessions were audio recorded and the children whose parents had given consent were video recorded. After viewing each clip, the children were asked to tell a story about what had happened in the clip. If at any point the child seemed bored or uncomfortable, they were asked if they wanted to continue. If they chose not to continue, they were taken back into their classroom and the next participant was invited.

Two separate experimental trials took place across four days. Each clip was viewed fully once before the storytelling prompt was given. While the child narrated, the clip was repeated for as long as the child kept talking and answering questions. If the child did not freely elaborate, additional prompts were given. In order to encourage the children to engage in pretend play and to assign relationships, we asked, "If you were pretending those were characters in a story, who would they be?" Additionally, we encouraged the children to assign judgment to the interactions and characters using the following prompts: "Is the group being nice or mean to the individual?", "Is the individual being nice or mean to the group?", "Is the group good or bad?", "Is the individual good or bad?", "How do you think the individual feels?", and "How do you think the group feels?" Any time the children assigned character names or relationships, we replaced the words "group" and "individual" with the character assignments (e.g., "Do you think the mommy is being nice or mean to the babies?").

Analysis. We performed the same set of analyses for the second experiment that we used in the first experiment. Again, we were interested in differences between and within the age groups (two- and three-year-olds, and four- and five-year-olds) and between and within gender. We analyzed and compared the children's stories according to valence, use of social identifiers, relationship changes, and in-group/ out-group membership of characters relative to the participant. The data from this experiment was more complicated than that from the first since the video clips involved an individual and a group. Since children did not typically generalize the behavior of all characters in the clip, we separated their responses into relevant information for the group, the individual, and the interaction overall.
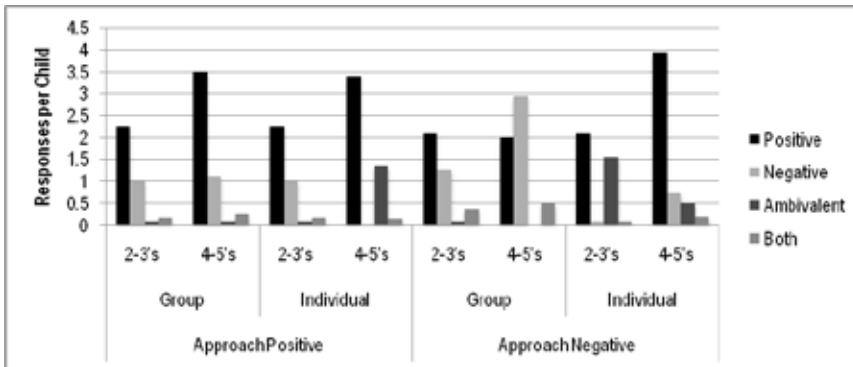
Results: Valence.

Age difference. Both age groups interpreted the valence of the group's behavior differently than the individual's behavior for both sets of clips (see Figure 5). On the *Approach Negative* clips, both age groups were significantly more likely to attribute a positive (t(29)=3.340, p=0.002) or ambivalent (t(29)=3.938, p<0.001) valence to the individual instead of the group and a negative (t(29)=4.575, p<0.001) or both (t(29)=2.187, p=0.037) valence to the group instead of the individual.

Both age groups showed an overall trend to attribute a positive valence most often to both the group and the individual in the *Approach Positive* clips, but some significant differences were still present between the two age groups (see Figure 5). Significantly more two- and three-year-olds attributed a negative valence to the individual in the *Approach Positive* clips than four- and five-year-olds (t(29)=2.305, p=0.028). Additionally, four- and five-year-olds attributed an ambivalent valence to *Approach Positive* clips than two- and three-year-olds (t(29)=3.050, p=0.005). Though a positive valence trend was still present for the *Approach Negative* clips, the four- and five-year-olds attributed a negative valence more often than two- and three-year-olds (see Figure 5).

Gender differences. There were no significant differences between genders in their tendencies to attribute valence to either set of clips, but there were differences in the way each group interpreted the behavior of the group and individual. Both genders interpreted the group's behavior in the *Approach Negative* clips negatively more often than the

**Figure 5. Interpretations of the Group's and
Individual's Valence.**

individual's behavior (t(14)=3.46, p=0.004 for females; t(15)=2.931, p=0.010 for males). For *Approach Positive* clips, males attributed an ambivalent valence to the individual significantly more than the group (t(15)=3.478, p=0.003). No other results from the *Approach Positive* clips were significant.

Use of social identifiers. There were no significant differences between or within age groups in their use of social identifiers. However, significantly more females used social identifiers than males (t(19)=2.518, p=0.018) during the *Approach Negative* clips.

Results: Character Assignments and Relationship Changes.

Age group differences. All children relied on size cues most often when changing character assignments. In general, four- and five-year-olds tended to make more changes in character assignments that corresponded to size than three-year-olds (see Figure 6), but this finding was only significant when the group was bigger than the individual (t(29)=2.470, p=0.020).

On the *Approach Negative* clips, four- and five-year-olds made relationship dynamic changes that made sense according to hierarchy more frequently than three-year-olds (t(29)=2.036, p=0.051). They also made more changes that made sense according to group membership (see Figure 7), but this result was not significant.

Figure 6. Character Assignments and Visual Cues.
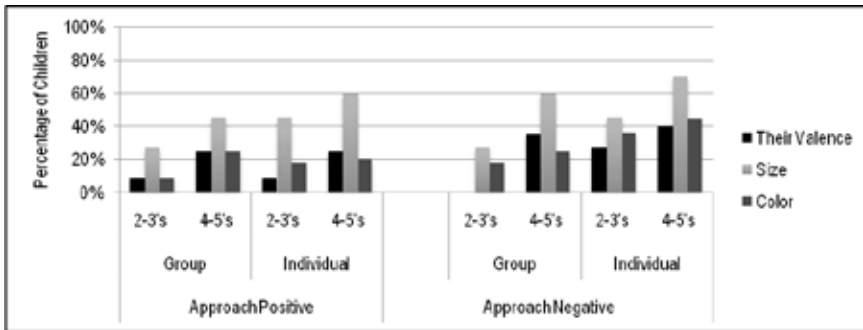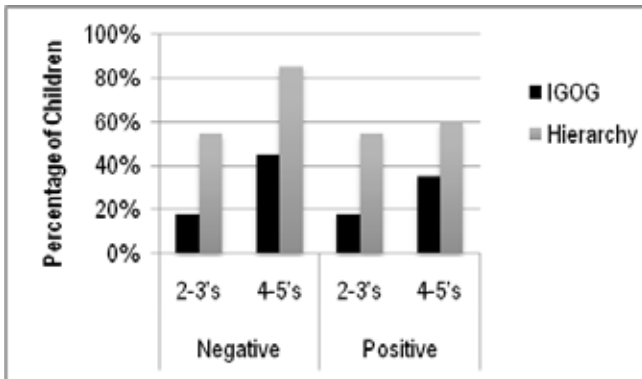

Figure 7. Changes that Make Sense for Approach Positive and Approach Negative.

Females changed their character assignments and relationship dynamics more consistently than males (see Figure 8). For both sets of clips, significantly more females than males made changes to the individual's character assignment (t(29)=2.158, p=0.039 for *Approach Positive*; t(29)=3.077, p=0.005 for *Approach Negative*) and to the relationship dynamic (t(29)=2.158, p=0.039 for *Approach Positive*; t(29)=2.923, p=0.007 for *Approach Negative*). In *Approach Negative* clips, significantly more females than males also changed the group's character assignment (t(29)=2.039, p=0.051). They also made more changes in the individual's character assignments corresponding to changes in the child's valence attribution (t(29)=3.077, p=0.005), size

visual cue (t(29)=2.158, p=0.039), and color visual cue (t(29)=2.989, p=0.006).

**Figure 8. Relationship Changes and Visual Cues,
Approach Positive and Approach Negative.**
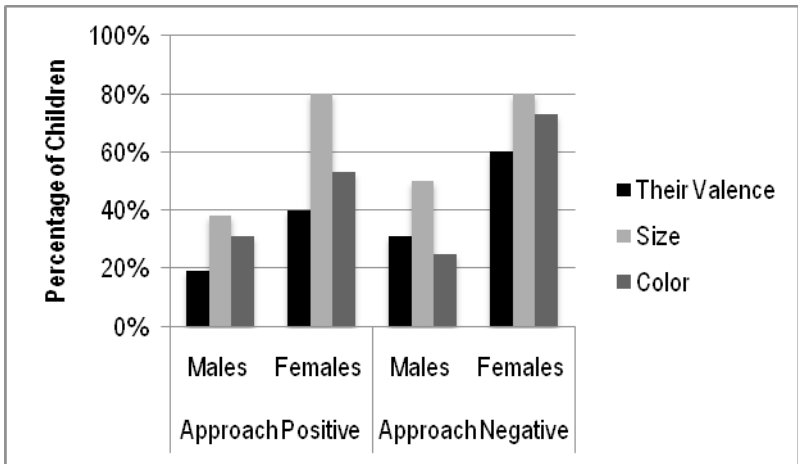
Overall, the majority of the relationship changes made sense according to hierarchy for both genders, however, there were many significant differences between males and females (see Figure 9). More of the relationship dynamic changes that females made during the *Approach Negative* clips made sense according to in-group/out-group membership (t(29)=2.086, p=0.046) and hierarchy (t(29)=2.518, p=0.018) than those made by males. Additionally, more of the relationship dynamic changes that females made during the *Approach Positive* clips made sense according to hierarchy than those made by males (t(29)=2.568, p=0.016).

Results: Group Membership Relative to Participant.
  Gender differences. There were no significant differences between or within genders on assigning characters based on their own in-group and out-group.
  Age differences.   In addition to the group assignments relative to the individual in the video clips, we also examined the group assignments relative to the participant and the valence changes corresponding

Figure 9. Changes that Make Sense According to IGOG and Hierarchy.
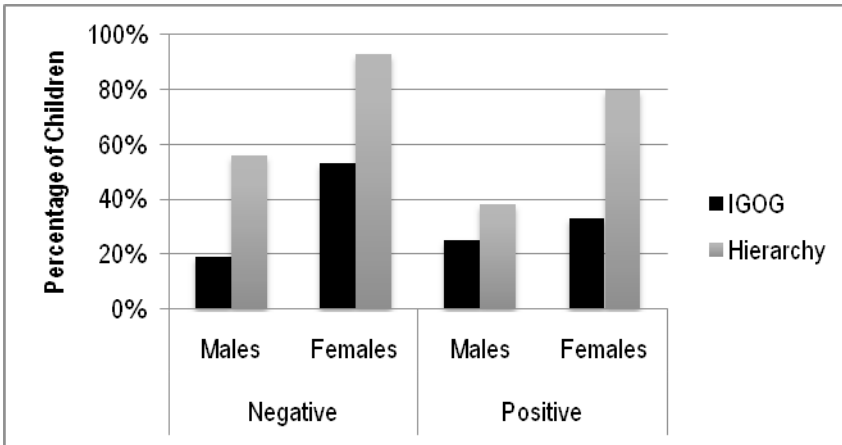
to these assignments. Four- and five-year-olds had a tendency to differentially interpret the valence of the group in *Approach Negative* clips based on whether they were in their in-group or out-group even though the actions in the video clip were exactly the same (see Figure 10). A group that was considered part of their in-group tended to receive a positive valence more often than one that was part of their out-group (t(19)=1.761, p=0.094). Furthermore, a group that was considered part of their out-group was attributed a negative valence significantly more than an in-group one (t(19)=2.759, p=0.012). There were no significant differences for *Approach Positive* clips. Two- and three-year-olds also showed some in-group bias, though not to the same extent as four- and five-year-olds. Specifically, they attributed a positive valence to an in-group individual significantly more than they did to an out-group individual (t(9)=3.087, p=0.013). Overall, four- and five-year-olds were attributed a negative valence to an out-group group more frequently than two- and three-year-olds on *Approach Negative* clips (t(29)=2.977, p=0.006).

General Discussion

　　Research conducted by Premack and Premack ("Infants Attribute Value") suggests that infants are capable of interpreting social inter-

Figure 10. Interpretations of Valence and Group Membership.
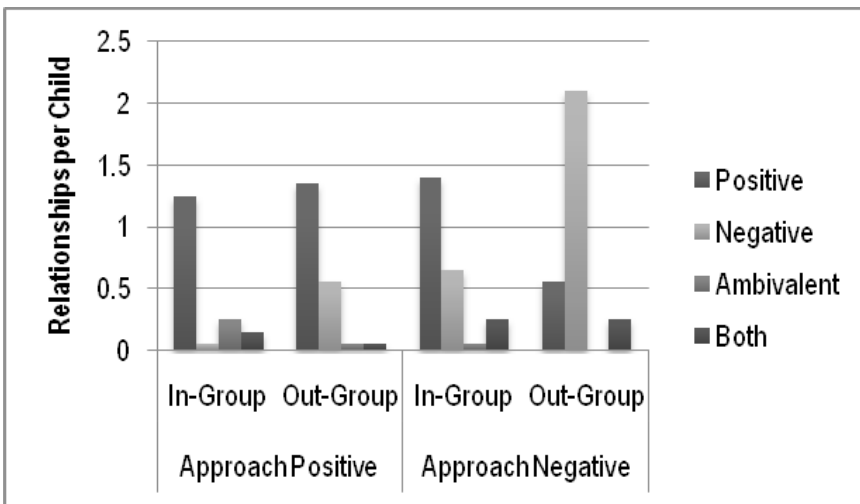
actions as positive or negative. We wanted to provide a follow-upto the social perception research on infants by studying a population of preschool children (ages three through five). We chose this age group because children at this age are capable of telling stories to articulate their judgments. The present study investigated preschool children's interpretations of multiple social interaction videos, including *Helping, Interfering, Playing, Chasing, Approach Positive* and *Approach Negative.* Within these video clips, we manipulated valence, size, and color visual cues. For both experiments, we analyzed children's narratives of the videos according to valence interpretation, use of social identifiers, character and/or relationship assignments, and group membership relative to the participant. We found that, overall, preschool children were sensitive to visual cues and many verbalized their interpretations and judgments of the interactions in the video clips.

Our results for the first experiment were varied for both age and gender differences, with each group outperforming the other on the same criteria during different trials. Though our results suggested that four- and five-year-olds were more dynamic than three-year-olds in the stories they told, the results were difficult to meaningfully interpret independently due to fundamental limitations in the design (the "third character" in *Helping/Interfering* clips) and procedure (inconsistent

pretend play instructions) of this experiment. To address some of these limitations and to elaborate upon previous significant findings, we performed a second experiment. The results of the second experiment confirmed that four- to five-year-olds and females interpreting the video clips in more dynamic and meaningful ways than two- to three-year-olds and males, respectively.

Valence

Overall, we found that preschool children in both age groups interpreted the behaviors of the characters positively most of the time during both experiments. Many of the children recognized a *Chasing* interaction accurately as one character running after another, for example, but would say that the individuals were "playing tag" and being "friends," regardless of their character assignments. One member of the four-and five-year old age group described an *Approach Negative* clip in the following way: "The [big pieces of corn] are just rolling [the baby pea] back and forth…he asked them to play that game…they are pushing him slowly with their hands." The *Approach Negative* clip depicted an interaction involving high intensity, rapid motion, two factors indicating negative social interaction (Premack and Premack, "Infants Attribute Value"); however, this and many other examples illustrate that children found ways to justify the behaviors and interpret them positively. Their general optimism about people's behaviors and intentions is likely due, in part, to little experience with truly negative social interaction and their dependence on others around them. Though preschoolers may personally experience bullying to some extent, it is (ideally) unlikely that they have interacted with others in deliberately malicious ways. They can feel more secure in their relationships if they believe that other people are usually behaving in socially responsible ways.

Though there was a general optimistic trend, valence responses typically varied more when our intended valence was negative. They may recognize that something diferent, and perhaps socially unacceptable, is occuring between the characters based on visual cues even if they are reluctant to explicitly judge the interaction and characters involved negatively. Furthermore, there was frequently a discrepancy between children's valence interpretation for the behavior and their valence interpretation for the characters involved. Based on

previous research, we expected children to describe characters who engaged in negative interactions in negative terms, such as "mean" or "bad" (Schubert, Waldzus and Seibt). Though many participants showed the expected trend, several children accepted the character while rejecting the behavior. For example, when one three-year-old was asked what the group was doing in an *Approach Negative*, he said "hitting her," but when asked if the group was nice or mean, he said "nice." Though hitting is considered a mean action, this behavior did not reflect upon the group's valence for this particular child. The ability of some children to separate the valence of a behavior and the individual engaged in the behavior may suggest a dynamic understanding of social interactions as temporary and relative, rather than absolute and unchanging. Children from both age groups seemed to recognize that nice people do bad things sometimes.

During the second experiment, our video clips depicted a group approaching an individual and either accepting (synchronized motion) or rejecting (rapid, intense motion) the individual. Previous research suggests that children trust information provided by a consensus more often than an individual (Chen, Corriveau, and Harris, "Impact of Race"). Adults also have a tendency to justify negative behaviors based on group membership (e.g., it is acceptable for a group of Americans, the in-group, to harrass an individual Muslim, the out-group, because he might be a "terrorist"). Based on reasoning, we expected that children would justify the negative actions of the group by agreeing with them and rejecting the individual themselves. However children did not meet this expectation. Specifically for *Approach Negative* clips, participants from both age groups had a tendency to judge the individual more positively than the group. Though it is not consistent with our expectations, this distinction is logical based on the interaction depicted in the video clip. The individual never appears to do anything negative; rather, he is just being pushed around by the others and leaves alone. It is possible that if the individual had appeared to "fight back," children would have interpreted it negatively more often.

Age differences. Four- and five-year-olds showed a higher sensitivity to visual cues for negative valence than two- and three-year-olds. They attributed a negative valence significantly more than the two- and three-year-olds specifically to *Interfering* and the group in *Approach Negative*

clips, both of which were consistent with our intended valence. The accuracy of four- and five-year-olds' valence interpretations relative to those of two- and three-year-olds suggests that children enhance this skill through development.

Gender differences.   We found evidence that males were more accurate at interpreting our intended valence for *Helping, Playing, Interfering,* and *Chasing* clips. On *Approach Positive* and *Approach Negative* both genders performed equally well. Males may be more likely to talk about "fighting," "punching," and "pushing" (all actual responses from males). It is also possible that females "decriminalize" and justify potentially negative behaviors more often than males.   Additional research would need to be conducted to examine these possibilities.

Character Assignments and Relationship Changes

Four- and five-year-olds were much more sensitive to the type of instructions they received on the first experiment than two- and three-year-olds. We adjusted and standardized the instructions given to all children during the second experiment, encouraging them all to engage in pretend play. We expected participants to make changes in character assignments or relationship dynamics based on valence, relative size, and relative color differences.

With regards to valence, we would expect characters with a higher social status, such as teachers and parents, to usually behave in socially acceptable ways, consistent with the concept of noblesse oblige (Fiddick and Cummins). We also expected an in-group bias, with the same interaction being judged differentially based on group membership status (Hitti et al.). If children were sensitive to valence cues and acute in their interpretations of them, we would expect a positive valence for high-status and in-group characters and a negative valence for out-group members. Many children did appear to be sensitive to valence cues while making character assignments.

Children who changed social relationship descriptions from at least one clip to another corresponded to size most often during all interaction types. They also referred to hierarchy relationships that made sense more often than in-group/out-group relationships. Preschool children may notice and interpret size cues more readily than color cues since there is a size difference between themselves and the adults they depend on in their lives (e.g., parents and instructors).

Many of them also have older and younger siblings, so they frequently spend time with smaller and larger individuals who look similar to them. Size may be more obvious for them simply because it is more familiar and meaningful to them than color (or group membership) differences.

We expected that group membership would be more important in children's interpretations during the second experiment, since the interaction involved a group and individual triggering group identification. Many children commented on a color difference between the individual and group, but few changed relationships because of it; even less changed relationships in ways that made sense according to group membership. Preschool children did not appear to associate physical similarity in color with in-group status often.

Age differences. Four- and five-year-olds were typically more sensitive to all visual cues than two- and three-year-olds when referring to social relationship changes. Previous research shows that infants (Premack and Premack, "Moral Belief"; Horwitz, Pietraszewski, and Wynn) and adults (Schubert, Waldzus, and Seibt) use relative size as an indicator of social hierarchy and physical similarity as an indicator of group membership. However, we did not find evidence to support that two- and three-year-olds necessarily understand those relationships. There are multiple possibilities why two- and three-year-olds made very few changes in relationships that made sense: two- and three-year-olds may not use size and color as indicators of social hierarchy and group membership, may not have the ability to accurately articulate the relationship, or may be using additional criteria to influence their relationship interpretations. Four- and five-year-olds appear to have developed the skill of accurately interpreting social relationships in terms of hierarchy and group membership to a greater extent than two- and three-year-olds.

Gender differences. Our first experiment did not indicate any difference between males and females on relationship assignments and corresponding visual cues. However, the results of our second experiment suggested that females changed their character assignments consistently with all visual cues significantly more often than males. Furthermore, a greater percentage of females changed relationship dynamics in ways that made sense according to group membership and

hierarchy. While males may be better at interpreting valence, females appear to be better at interpreting social relationships and the social dynamics between characters. Additional research is important to draw any conclusions about these findings, but females may be more relationship-oriented than males, even at this young age.

Group Membership Relative to the Participant

Our visual cue of color had an effect on children's references to group membership, but not as strongly as we expected. We noticed that, in addition to making changes in character assignments between each of the characters involved in the interaction, they also made changes in the relationship between the characters and themselves. We interpreted each child's character assignments according to their own group membership. Characters that we expect would be familiar to a child were considered in-group (e.g., "people," "kids" and "family members") and those that would not be familiar to a child were considered out-group (e.g., "balls", "pieces of corn" and "aliens").

After determining the in-group and out-group character assignments the children made, we sorted each group by valence. Previous evidence has suggested that young children exhibit in-group bias, or differentially judge the same behavior depending on whether the actors are part of their in-group or out-group (Chen, Corriveau, and Harris, "Impact of Race"; Makariev and Lagatutta, "Intergroup Relations"; Schug et al.). We expected children to attribute positive valence to their in-group more often than to their out-group and negative valence to the out-group more than their in-group. There was no significant tendency for our sample of participants as a whole to do so.

However, the four- and five-year-old group showed a strong in-group bias, specifically on clips with a negative intended valence. When they differentially interpreted the valence of the interaction, they were much more likely to attribute a positive valence to an in-group member and a negative valence to an out-group member. The effect was especially strong for their valence judgments of group in *Approach Negative* clips.

This result is especially relevant to findings by Markariev and Lagatutta. In their experiment, they presented children with one of four videos; in the first two, a member of the participant's race did

something negative (A) or positive (B) to someone from a different race and in the others, a member of a different race did something negative (C) or positive (D) to someone from the child's race. In situations A, B, and D, children judged the focal individuals equally on a likability scale. However, in situation C, the focal individual's likeability was lower than the others.

We also found that many children believe in-group members are usually being "nice," regardless of the type of interaction. Similarly, when out-group members are engaging in ambiguous interactions that could be interpreted positively, they are typically being "nice," as well. Previously discussed optimism towards the behavior of people around them may make children feel more stable in their relationships; since the people around them are typically members of the in-group, the optimistic effect may be especially strong. However, when out-group individuals are engaging in ambiguous interactions that could be interpreted negatively, they are typically being "mean." Two- and three-year-olds did not show a tendency to commit an in-group bias. The result of in-group bias for four- and five-year-olds and not two- and three-year-olds may suggest an important milestone in moral development around this age.

With an increased ability to assign group membership status to characters, four- and five-year-olds may have also developed unequal ways of judging characters that are different from them. From our results, we can only conclude that they interpret the behaviors of non-humans differently than they do the behaviors of humans, but if it extends to within-human differences, such as race or religion, in-group bias could play an important role in discrimination and prejudice. Further research would be needed to replicate our findings regarding the differences between two- and three-year-olds and four- and five-year-olds on their tendency to commit in-group bias. If our results are supported, it could indicate a key time period for discrimination prevention. Even if in-group bias could not successfully be reduced, we should encourage young children to accept more people into their in-group by letting them know that they it is not necessary to reject someone's friendship because of differences in skin color, religion, or family origins.

Limitations

A possible limitation of the current research includes the relatively small sample size from a single preschool. We may not be able to generalize the results to all two- and three-year-olds and four- and five-year-olds or children enrolled in other preschools. There was a large difference in group sample size between males and females and between two- and three-year-olds and four- and five-year-olds in the first experiment, though the difference decreased during our second experiment. The groups compared in this study were from pre-established classes based on age; confounding variables could include effects from the different classroom, teachers, schedules, activities, and class size.

The attention span of the three-year-olds was much lower than that of the four- and five-year-olds. For this reason, two- and three-year-olds saw fewer clips and had less opportunity to tell stories after seeing a variety of visual cues. Individual differences played an important role in our results, as well, though we did not have the opportunity to examine these in-depth. Some individuals had greater constraints on attention that impacted the questions that were asked; we were able to collect a lot of data from some individuals and almost none from others. However, individual differences impact all real groups, and we were able to find significant results regardless of individual differences.

Further Directions and Implications

We plan to extend this research to include other types of group interactions and different cues. We would eventually like to implement sound into the videos and see if auditory cues impact hierarchy or group membership interpretations in similar ways to visual cues. Further research should also utilize participants from other schools, and perhaps a larger range of age groups.

Our results suggest that children innately have an ability to interpret social interactions as positive or negative and to infer relationships between interacting characters. This research can be used to better understand what criteria children use to judge the behaviors, intentions, and character of other individuals. Our research suggests the importance of encouraging imaginative play, keen interpretations of interactions, and discouraging in-group bias. Furthermore, by recognizing the differences between males and females and between

two- and three-year-olds and four- and five-year-olds, we can target the factors that lead to in-group bias and discrimination at developmentally appropriate times.

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